portance who ventured to defend it. For the most obvious properties of things may be of trifling importance compared with those which are not obvious, as we acknowledge when, for example, we divide plants into dicotyledons and the monocotyledons.

Yet, when I say this to the physician, who, as a man of science, must constantly reopen the theorems of physiology, I do not forget that the practical physician, like the farmer, must have rules suitable to common cases—rules which point out the “least perilous way.” As Dr. Whewell observes (*Novum Organum Renovatum*, p. 286), “a plea that human laws which mention fish do not apply to whales would be rejected at once by an intelligent judge.” Health and disease are both equally functions of living bodies, and, scientifically speaking, one is as good as the other. But in art we must have rules and precepts as well as natural laws; we must have a teleology to dictate not what is but what ought to be. Yet such precepts or axiomata media, if they are to serve us well, must continually be altered as we push forward the discovery of those natural laws which are the Institutes of Medicine. Again, when I say that a knowledge of disease must base itself upon a complete survey of both the great kingdoms of life, and when I say that every disease and disorder of man has been evolved from the variations of lower animals and plants, and must, in every shade of them, be developed from the implicit properties of the ovum or even of protoplasm,⁵⁷ yet I admit no less readily that, as in the lowest forms of life these actions are rudimentary or feeble, we should study their variations best in man, in whom they are most explicit and have their highest intensity, were it not for that old source of error: “Errare non modo affirmando et negando, sed etiam sentiendo.” Were I worthy to use the irony of Socrates well might I cry, *ἄκων εἶπαι σοφός*. While we are theorising of diseases the fates prevail over our counsels. Nevertheless, with such intellectual powers as we have must we “go sounding on our dim and perilous way through words and things.” As said a great critic of the third century, “Of what did those divine ones take regard..... As well as of many other things they had regard of this—that Nature did not judge man to be a mean or ungenerous animal, but introducing us into this life, into this universe, as into a great assembly, to behold her contests and to be keen competitors in her rivalries, she implanted in our souls an irrepressible love of whatever is great and nobler than ourselves. And therefore the whole world is not enough to satisfy the speculation and apprehension of human understanding, but our reflections will often travel beyond our environment.”⁵⁸ Thus have my reflections wandered to-day, “striving to attain by shadowing out the unattainable.”

Gentlemen, many of us too well know conditions and times of abasement; times when we see Nature beautiful, magical, but remote, unmindful, pitiless; when we humble ourselves in silence before “Him who fastened the foundations of the earth, who spread His light upon it and balanced the clouds of the air, who binds the sweet influences of the Pleiades and guides Arcturus with his sons; who gave to the horse his strength, and goodly wings unto the peacocks, and who is King over all the children of pride.” But the time and circumstance of this Convocation bring not these moods of awe and withdrawing but surely those of hope and uplifting even to victory; for, like Jacob at Peniel, we have striven with the Great Unknown, not without prevailing. Our mood to-day is rather that of Sophocles in the well-known words of the Chorus of the *Antigone*, “Wonders are many and none more wonderful than man; the power that crosses the white sea, driven by the stormy south wind, making a path under surges that threaten to engulf him; and Earth, the eldest of the gods, the immortal, the unweary, doth he wear, turning the soil with the offspring of horses, as the ploughs go to and fro from year to year..... And he masters by his arts the beast whose lair is in the wilds, who roams the hills, he tames the horse of shaggy mane, he puts the yoke upon its neck, he tames the tireless mountain bull. And speech, and wind-swift thought, and all the moods that mould a state, hath he taught himself; and how to flee the arrows of the frost and of the rushing rain; yea, he hath resource for all; without resource he meets nothing that must come: only against Death shall he call for aid in vain—*νόσων δ' ἀμύχανον φυχὰς ἐμπεύραστα*—but from baffling maladies he hath devised escapes.”⁵⁹

ADDRESS IN SURGERY,

BY

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ON THE PROGRESS OF SURGERY DURING THE LAST HALF CENTURY.

GENTLEMEN,—Deeply sensible as I am of the honour done me in being entrusted with the Address in Surgery on this the first occasion on which your great and important Association has visited this city, I am nevertheless overwhelmingly conscious of my inability to do justice to a position which has been on previous occasions filled by representatives of all the great schools of this country. Your indulgent kindness can alone sustain me in my attempt to follow in their footsteps.

It is my wish, in the time devoted to this address, to attempt a brief epitome of the leading advances which Surgery has made during the auspicious reign of Queen Victoria, as that period is naturally suggested by recent events, and is one over the greater part of which my own recollections extend. It is fully admitted that in every department of human knowledge our half century has been signalised by a progress greater, more momentous, and more permanent than any other in the world's history; and in this advance medicine in all its branches has so largely and bountifully shared that even a bare recital of what has been done fires the imagination and makes the heart throb with triumph.

Since 1837 all the collateral sciences on which medicine so largely leans have been in a great measure reconstructed, and the very foundations on which our art is built have been in no small measure relaid.

It is with pardonable pride that one speaks of medical science in this northern land, where for so long a time it has acquired a high place by the fruitful labours of many devoted men; and with no department of the one great and indivisible art have the names of Scotchmen been more honourably associated than with that which I to-day humbly represent. We are met in the city where Peter Lowe early sowed the seeds of surgical knowledge and founded one of the oldest of the corporations, and we are within the walls of the University where that modern steam engine was born which has more than trebled man's physical power, and has so largely contributed to the national success and the well-being of mankind.

In this ancient institution, originally “part of the great corporation of the learned men of the world,” and the daughter of that far more venerable University of Bologna, which has just celebrated her eighth centenary, men celebrated in all the departments of mental and physical science have lived and taught. Not a few who afterwards largely contributed to the reputation of other schools (Cullen, Black, Charles Hope, Wm. Gregory, Thomas Graham, Granville Pattison, Ure, Hooker, Balfour, Lister) began their career here as medical teachers—men who have gone elsewhere, like the wandering Scottish surgeons of the Middle Ages, who in their time helped to enrich so many Continental colleges. We cannot forget that the immortal Hunters were educated in Glasgow, and that from regard to his old school the elder brother bequeathed to us his museum, and in 1765 proposed to Cullen the establishment of a medical school, for which he offered to build a theatre, and teach for no other motive than the love of his art. The early history of surgical anatomy, too, owed much to Allan Burns, whose premature death deprived Glasgow of a man of the greatest promise. My time, however, will not allow of further local references, though one other fact I will state, as it may tend to show with what fervour and enthusiasm learning and medical science is regarded in Scotland. While in England 1 in 5,000 attend the universities, in Scotland 1 in 600 avail themselves of that privilege—a remarkable fact when it is remembered that the universities here at first possessed no endowments but the privilege of teaching, and the scholars no claim but ambition to learn. Of the 1,639 medical students registered last year in Great Britain, no fewer than 666 belonged to the Scottish schools.

To understand aright the position of surgery in 1837, a few preliminary leading facts must be stated. Before 1800 much had, no doubt, been done in anatomy by “the great masters,” but as a

⁵⁷ Vide the researches of Gaskell, Walter Gardiner, Spencer Moore, and others.

⁵⁸ Longinus, *De Sublimitate*, ed. Valden, Bonnæ, 1857.

⁵⁹ *Antigone*, 332-364, Jebb's translation, 1893.

science it has certainly been reconstructed within the last fifty years. The microscope and new methods of study have entirely changed its whole bearings. Comparative anatomy has assumed its appropriate place, and pathological anatomy has been created. To John Hunter (though derided and defamed by many of his contemporaries as a mere theorist) we owe more than to any other man. He brought order out of chaos, and established surgery on the only sure basis of observation and experience; making, as Malgaigne has well said, a "science" of what Paré and Petit had left but an "art." He was the teacher of the leading men who followed (Abernethy, Lawrence, Cooper, Home, and the Bells), and the inspirer of all that was best and most abiding in British surgery. Before 1800 the great Continental and British schools of surgery had been founded (Berlin, 1714; Edinburgh, 1719; Dublin, 1710; Paris, 1721; London, 1750; Vienna, 1750). The old Academy of Surgery in France, which had achieved much, died with the other medical schools of that country, at the hand of the revolution, whose centenary falls this very year. "Knowledge" was said to be "aristocratic," and medical science was not made an exception till the needs of the great war, in which 600 surgeons fell in eighteen months, recalled to life the medical institutions of France, and inspired them with an energy and enthusiasm without parallel. Desault, one of the greatest surgical teachers who ever lived, died amid the throes of the revolution. It was well said that when men amidst the crash of all order did not know where to look, "Desault showed them the way, and led them to the Hôtel Dieu." He and Dupuytren, who succeeded him, established a great school, though neither contributed directly hardly a line to the literature of their profession. Bichat, the pupil and literary executor of Desault, did for general and pathological anatomy in France what John Hunter a quarter of a century before, had accomplished for us. He died in "the glory of his manhood" and of his literary fame, at 31 (an age at which it is said Hunter could hardly read), having in the short space of 2½ years revolutionised medicine in France. He passed the torch to Laennec (whose great discovery of auscultation was made public in 1819) and Bayle; and above all to Dupuytren.

From the beginning of the nineteenth century up to 1837, two figures stand out from the great throng of the distinguished surgeons of that period, Dupuytren in France, and Astley Cooper in England. They had much in common, but more that was dissimilar. Both were absorbed in the same pursuits,—anatomy, experimental physiology, and pathology, in their bearing on practical surgery. Both possessed a perseverance and a devotion which has been seldom equalled, and never excelled, an originality too, which sought to conquer everything for themselves, and a success which has never been approached. Here, however, the resemblance may be said to cease. Cooper's generous and open disposition made him beloved of all; while the gloomy hauteur, crafty malignity, and unscrupulous selfishness of his rival, caused him to be feared and hated. Notwithstanding this, Dupuytren was beyond question the greatest teacher of the age, beyond all others inspiring the men who afterwards became the glory of the French school. Nélaton, the "most modest and one of the greatest" of surgeons, whom many of us knew, was his assistant and successor, and the last who gained his chair by "conours" (1851). Cooper survived until 1841 (he was a candidate with the great Duke of Wellington for the Lord Rectorship of this University during the year of the Queen's accession), and was universally regretted; while, when Dupuytren died in the zenith of his fame in 1835, it was said that the surgical world was relieved "from the burden of his authority, which had pressed on it like a nightmare."

Almost contemporary with these men (he died in 1826) was Scarpa, who in Italy worked much on the same lines, but from the slight international intercourse which then prevailed, they knew but little of one another's labours. Incredible as it may seem, we have it on the best authority that the doctrines of John Hunter were hardly known in France for forty years after they were promulgated, and in the first edition of Boyer's classical work on *Surgery*, published in 1814, the labours of the English and Italian schools are ignored. After the peace of 1814, surgeons on either side of the Channel became, for the first time, acquainted with one another's progress, and Roux's celebrated *Parallel* spoke with enthusiastic admiration of the courage and enterprise shown by British surgeons in tying the great vessels, resecting joints, and promoting early adhesion. Then it was Boyer wrote that "surgery seems to have attained the highest degree of perfection of which it is capable!"

Between 1796, when Abernethy first tied the external iliac, and 1827, when Mott ligatured the common iliac, all the great vessels (including the abdominal aorta) had been tied in Great Britain or America.¹

In 1837 the doctrines of Broussais, which had been accepted with the enthusiasm of a revelation, and had deeply imbued the surgical as well as the medical practice of the day, had spent their force. Hahnemann and Brown, Gall and Spurzheim, had come and gone with their disturbing influence, and men turned wearily from the discussion of mere doctrines and the dogmas of authority to a careful study, aided by experiment, of *facts*. Many remarkable discoveries in mechanical science, especially that of the achromatic microscope (1824 and subsequent years), the spectroscope, and the applications of electricity, powerfully contributed to the rapid progress of biology, morbid anatomy, pathology, and chemistry. In 1838 Henle and Mandl made known what their countrymen had then accomplished, and the members of the German school have ever since been the most enthusiastic and competent workers on these subjects.

The most distinguishing features of the period under review (1837 to 1887) have undoubtedly been anæsthetics and antiseptics. They are both "epoch-making" discoveries. Each has done almost as much for surgery as the discovery of hæmostatics, and when combined may, I think, be said to excel even steam and electricity in their gracious benefits to mankind. Though from the earliest times men sought for the means of allaying pain during operation, and numerous imperfect methods (as that of Dr. James Moore of this city, the younger brother of Sir John Moore, by compressing the nerves) had been tried to effect it, yet the statement of Velpeau, published in 1839, may be taken as expressing the opinion held seventeen years before the great discovery—"All research for an agent to destroy pain in operations is a mere chimera and unworthy of further consideration." Suddenly, however, the riddle was solved by one who, recalling the experiments of Humphry Davy with nitrous oxide and sulphuric ether, dimly perceived the use they might be put to in surgery. Whatever credit in this matter may belong to the unfortunate Horace Wells, it was really Mr. Morton who worked out the practical application of ether, and in the theatre of the Boston Hospital may still be seen the sponge by which it was administered on that memorable October morning in 1846. Many of us can still recall the enthusiasm which that discovery evoked, and the unbounded anticipations which it suggested. After the abortive trial of various other agents, chloroform was brought into use by Sir James Simpson, within a year of the time when attention was directed to the subject. This, the most valuable of anæsthetics, was discovered by Soubéiran in 1831, and had been shown to be a powerful anæsthetic by Flourens some years afterwards. Many years have passed, but we remember with amused astonishment some features of the warm controversy which arose regarding these agents—the frivolous objections ("religious" and other), the endless discussions and statistics—the hopes and fears which were expressed. It is not perhaps too much to assert that the relative merits of these and other anæsthetics, which I need not stop to enumerate, have not even now been universally determined. I myself, after fairly trying most of the agents in use, now exclusively employ chloroform, and having for years kept an accurate record of its administration, and given it freely and without stint in all sorts of surgical proceedings, never refusing its benefits to a single patient, no matter what his condition or the operation to be performed, I have never had an accident except once, when an epileptic took a fit while being put under its influence, and died with a full and fixed chest. For speed and energy, for ease of application and agreeableness, for rapid recovery with little subsequent trouble, and for safety *when properly administered*, chloroform is, in my opinion, unrivalled. That it needs no apparatus but a towel is a great point in its favour. This is the record of one who has administered it constantly almost from the time of its introduction into practice, and the statement in this sense may not be without its value. I never measure the quantity used, but exhibit it freely, and take the colour of the lips and the respiration as my chief guides. Making the patient count at the beginning of the administration is a most valuable aid; and Nélaton's inversion of the body with artificial respiration is, I think,

¹ External iliac by Abernethy in 1796 and 1806; primitive carotid by Cooper in 1805; subclavian, attempted by Cooper in 1806 outside of the scalenus; the same by Ramsden of Edinburgh in 1809; inside scalenus by Colles in 1811; internal iliac by Stevens of Santa Cruz, 1812; common iliac by Gibson of Pennsylvania, and Mott, in 1827; innominate by Mott, 1819; abdominal aorta by Cooper, 1817; brachial by Mott, 1818.

the surest mode of resuscitation in danger from failure of the heart. A minute is about the average period for inducing insensibility; and it is very rare, if proper precautions are taken in the way of preparation and after-management, to have any sickness. There is little doubt that "nervous" persons and those who are intemperate in the use of alcohol, tobacco, and narcotics, and also epileptics, require special care. Over-saturation from the too frequent renewal of chloroform induces, in my opinion, the chief after-trouble.

Local anæsthesia in its present form is also a conquest of the last half century, and though many agents possess this power, and some of them, like cocaine, are specially valuable for particular purposes, the finely-divided ether spray introduced by Dr. Richardson (a distinguished student of the Glasgow school) in 1866, is more efficient and easy of application than any other for practical purposes. Finally as regards this point I may note that Braid, of Manchester, who published in 1843 on hypnotism, caused much interest in a system which had been largely tried in India, but which has now fallen entirely out of use.

I need hardly say that anæsthesia has changed the whole face of surgery. "The lion heart" is no longer the requisite of a surgeon. Finesse and manipulative skill now take the place of force. Innumerable operations are rendered possible which could not before be attempted, and the surgeon has benefited almost as much as his patient.

It was in this school that the other great improvement of our time, the use of antiseptics in surgery, was practically applied, so that I might be pardoned if I spoke warmly and enthusiastically of that invaluable discovery. But as its principles and practice (though doubtless much modified and simplified of late years) are so well known, and have been so much discussed in former addresses to your Association, and in the whole range of our professional literature, I have no excuse for dwelling upon it at any length now. Suffice it to say that, notwithstanding all the criticism and opposition which it has met with, the fundamental principles on which it rests remain, in my humble opinion, unassailable, and that it has led to practical results (not alone in its immediate effects, but in the discussions and studies which it has produced) which have, in an extraordinary degree, widened the domain of our art, diminished the sufferings, and saved innumerable human beings.

The study of micro-organisms which a quarter of a century ago were mere microscopic curiosities have been an outcome of the controversy. Within a few years the tracing of the life-history, varieties, and changes under cultivation of bacteria has become a great and enthralling pursuit, and has opened up a field of practical application, not in medicine and surgery alone, but in hygiene and public health, which the most far-seeing cannot pretend to limit. The present tendency is, perhaps, to exaggerate the influence of microbes, to take effects for causes, and ascribe to their agency almost every ailment. It was not till 1837 that the true nature of the yeast plant and its effects on fermentation were discovered, and as many diseases were long thought to arise from a process similar to fermentation, an entirely new view of pathological phenomena was suggested. The remarkable observations of Koch on the bacillus of malignant pustule foreshadowed what has been done for other similar disease-producers; and now what was lately but a dream seems, by the revelations of experimental pathology (for clinical observation alone would take generations to accomplish it), to be capable of realisation in the near future: namely, that every zymotic disease, and all those which owe their origin to putrefaction and fermentation, will be finally stamped out. What a consummation if septicæmia, pyæmia, erysipelas, puerperal fever, spreading gangrene, *et hoc genus omne*, were arrested at their inception, yet such promises to be the reward of those methods of study now pursued, which teach us the nature and varieties of the morbid agents, their different modes of propagation, their channels of access to, and exit from, the body, with their effects under different conditions on the tissues and the economy.

The practical application of aseptic surgery has amazingly augmented the importance and value of the surgeon's services, as the advantages of that system cannot be secured without wide knowledge and great assiduity on his part. Perfect drainage; entire rest, both mechanical and physiological² (which includes the

avoidance of all tension in the wound), and such attention to hygienic and constitutional conditions as will maintain and increase the resistance of the tissues, and of the general system, to the invasion of disease, are essential to the "system" on which wounds are now treated, and demand the most assiduous care from the practitioner. Of the many germicides which have been used I undoubtedly prefer the bichloride of mercury, which, with the soft alembroth lint and Gamgee elastic absorbent wool, are most perfect local applications. Dry and elastic dressings (the many medicated and absorbent wools, cottons, and lints now in use) have been, in my experience, most valuable advances in wound management. With reliable antiseptics (that is, agents which are capable of destroying the septic germs, or, at least, inhibiting their development, without at the same time causing local or constitutional harm), and with a scrupulous attention to details which must never flag, almost every organ and cavity of the human body may be, and have been, invaded, in some cases, perhaps, with too confident temerity.

There is no more interesting study in surgical history than the development of our present practice as regards wounds, from the blind groping of the surgeons of last century to discover the secret enemy which baffled their best efforts, to the brilliant dawn which we have been permitted to see. Hunter, and others before him, recognised the evil effects of atmospheric air, especially as met with in hospitals, and futile attempts were made to exclude or medicate it with various gases and fluids. The exigencies of military practice brought about the substitution of pure water for the filthy poultices, ointments, and balsams, and simplified the mechanical appliances in use in civil practice. Irrigation followed the entire submersion of the wounded part (1839), and cold affusion, which became the fashion in both medical and surgical practice, culminated in the hydropathic system of the Silesian peasant, Priessnitz. The "glycerols" gave place to disinfectants (iodine, the salts of iron, alcohol pure and variously combined, chlorate and permanganate of potash, and many other agents), and of these, coal tar and its compounds attracted most attention. "Occlusion" by various plans, collodion, gums, gold-beaters' leaf, "insufflation," filters of purified cotton wool, etc., had all their day, till, finally, in 1860-1 Lemair, and in 1865 Declat, used phenic acid, and Pasteur's researches about the same time explained its remarkable properties. Independently, however, of Lemair's observations (published in 1863), and inspired alone by the discoveries of Pasteur, Sir Joseph Lister a few years later, 1866-7, used the same agent; and to his indomitable perseverance, scientific discernment, and philosophic grasp of the subject, we owe that practical application of antiseptics which has founded the "system" with which his name will be ever indissolubly and honourably associated. The rubber tubes of my old friend Chassaignac (1851), and the other means for securing drainage (bone and glass, metal and spiral wire drains, horsehair, catgut, etc.), the metallic sutures which, though described by Fabricius and others, are often erroneously attributed to Marion Sims,³ the ligatures⁴ rendered aseptic and so fundamentally different in their behaviour from some of these same materials as used by Crampton, Physick, Wardrop, Cooper, and others, have been the outcome of, or made subservient to the antiseptic method. The proper use and best form of deep and superficial stitches and dressings are also now well established, and the reign of dirty sponges and foul instruments and hands has passed away for ever. Modern pathology has put an end to the keen controversy which for 150 years bulked largely on surgical attention regarding purulent infection. The direct absorption doctrine of Boerhaave held the field till the middle of the eighteenth century and was followed by the hydraulic, the metastatic, the spontaneous generation, the phlebotic (in various forms) and other theories, till Virchow (1846-56) threw a new light on the subject by his researches on thrombosis and embolism, after which the investigations on sepsin, blood ferment, and micro-organisms explained what was still unintelligible.

As a result of the misfortunes of the Crimean war, and to a less extent, perhaps, from the alarm caused by the cholera epidemic of 1852, the construction and organisation of hospitals and other public institutions have received more attention during the last

³ Sims curiously thought metal sutures were the great surgical achievement of the century and "one of the most beautiful examples of the inductive philosophy!"

⁴ Chinese silk, doeskin, tendon of moose and Caribbean cariboo, of reindeer and kangaroo, aorta structure, silkworm and catgut, metal, india-rubber, vegetable fibre, etc.

² I desire here to express my great admiration of Hilton's Lectures on Rest and Pain. I consider them to be the most suggestive contributions to surgery which have appeared in my time.

25 years than during the previous 75 which had elapsed since Tenon wrote. The official statement in 1861 of the insalubrity of the Parisian hospitals (where it was said that it was the exception for a patient to recover from any important operation, so that many of them had to be abandoned), from the effects of that "hospitalism" to which Sir James Simpson in 1860 vividly drew attention, helped largely the progress of this question. That intra-mural hospitals are, however, on their trial, cannot be doubted, notwithstanding the immense addition which antiseptics have made to their salubrity; and the multiplication of village infirmaries, country adjuncts to city hospitals, and convalescent institutions since 1860 is evidence of the belief that smaller establishments in rural districts meet modern ideas more nearly than huge piles without space for fresh air and recreation, in the dense and polluted precincts of our great cities. I cannot avoid in this connection referring to the good that has been done in late years by the use of ambulance waggons, after the American model, for the conveyance of the sick, and for the instruction of many in the first care of the wounded. The nursing sisterhoods too, which originated with Miss Nightingale, are now our most valued assistants, and have been of unspeakable benefit to both patient and surgeon, while they have given an aim and object to the lives of many refined and cultivated women, by supplying them with a field well fitted for the display of their best and highest qualities.

Of the advances in doctrine and practice since 1837 much might be said. Not only has general anatomy been greatly advanced, but pathological anatomy has been created, while physiology has become a new and practical science under the influence of experiment. Chemistry has also been reconstructed. Experimental and microscopic research have elucidated in a remarkable manner the whole phenomena of inflammation and the febrile condition. The blood and its vessels, the reaction of the tissues involved, the part played by the nerves, the nature of the exudations, with their destinations and changes, as well as the growth, degeneration, and metamorphosis of structures, have all been laboriously studied by the aid of the microscope and by chemical processes. It was within the years 1838-39 that the cellular pathology was born. It took the scientific world by storm. Though, no doubt, it can be plausibly asserted that both John Hunter and Raspail dimly foreshadowed it, certain it is that Schleiden, Schwann, and Müller laid its true foundations, while Virchow and his pupils worked it out. Constant advance continues to be made by the use of new and improved methods of research, so that our knowledge of the ultimate elements of the tissues is daily increasing. An immense scientific activity followed the year 1840. Within a few years almost all the tissues and organs and the secretions of the body, both in their normal and altered conditions, were laboriously studied, and the phenomena of the respiratory, digestive, and nervous systems, as well as the great subject of embryology, which throws so much light on congenital deformities, were largely investigated, and by none with more ability than by my late colleague Professor Allen Thomson.⁵

Within the last half century, and especially since the discovery of anæsthetics, all surgical operations have been greatly improved, and many new ones have come into use. The operator being no longer hurried, or his feelings harassed by the sufferings of his patient, and happily possessing better control of the result, is left free to plan and conduct his operation without embarrassment.

In this progress of operative surgery, amputation has largely shared. The improved methods of arresting bleeding, both during and after operation, have essentially contributed to its perfection. The india-rubber (1873), and more lately the spiral-wire tourniquets of Esmarch, and the "bloodless" system (though now no longer carried out as at first practised), which these appliances rendered so easy of application, have been of the most eminent service in amputations and excisions, as well as in all operations on bones and deep structures. The old method of closing arteries by torsion (used by Galen and Avicenna, but more especially studied by Amussat in 1829), was much in vogue a few years ago; but it and acupressure (described by Heister and many others), which Sir James Simpson (1859) supposed would supersede all other hæmostatic methods, have been replaced by the antiseptic

ligatures now in use. The modern practice of using water at a temperature from 120° to 160° F., for the arrest of oozing is in my experience admirable.

Amputation by the circular method, after being exclusively used for over 1,800 years, was largely superseded by the flap operation; and in the Scottish schools, from the example set by Syme and Liston, it came into almost universal use forty years ago. The extraordinary dexterity ("his operation was as a flash of lightning compared with others," Fergusson), with which Liston amputated the thigh with only one assistant to hold the foot; compressing the vessel, and retracting the flaps, with one hand, while he cut and sawed with the other, is still a tradition of the Edinburgh school. The "oval" (or method in γ), so much employed at the joints, was introduced by Scoutetten in 1827; and the less known oblique or elliptic by Soupart in 1842. Innumerable varieties of the three leading methods, as regards the length, shape, number, and the tissues constituting the flaps, have been introduced into practice within the last forty years, and many of these have proved most useful. The square flaps of Teale (described in 1858), and now generally made with less disparity between their relative length, give an admirable result at some parts of the limbs. The other "modifications" of the standard methods at some places are endless, as for example, in the neighbourhood of the knee, but some of these are both fantastic and useless. Carden's and Syme's amputations are perhaps the most successful methods in use, and little improvement has been made upon them by the changes on the original plans which have been proposed at various times. They conform to most of the conditions requisite to a good method of amputation—viz.: sufficient and healthy covering falling easily into place and being easily retained, the blood-vessels, nerves, and cicatrix kept out of the way of pressure, the drainage perfect as the limb lies at rest, and all this with the least sacrifice of parts. Nowadays we must add that the operation should be performed at a place where a false limb could be best attached, as the modern improvements in mechanical science have altered the estimate we form of many procedures. Thus in Pirogoff's operation (1854) at the ankle, the stump is too long for a good foot to be attached, and Syme's method (even as now performed with a more limited heel flap) must yield to Roux's lateral internal operation, at least in adults, because of its greater facility of performance, better drainage, greater ease of retaining the equally good flap in position, and the less risk of sloughing from the better blood supply. The advantages of the osteoplastic methods, as in Pirogoff's and Gritti's amputations, in my opinion are more plausible than real.

Before the time when Syme's amputation became appreciated (that is before 1843), it was the practice to amputate below the knee for disease or injury of the foot, and that notwithstanding the fact that Lisfranc's and Hey's tarso-metatarsal amputation had been introduced in 1790, and Chopart's medio-tarsal in 1787. The longitudinal amputations of the foot have very properly almost disappeared from practice, as from the balance of the foot being lost, the result is not good; and the countless varieties of transverse amputations which have been suggested at various times have now almost entirely given place to amputation at the ankle-joint.

The amputation by which the bones forming the posterior portion of the tarsus are alone removed is still on its trial, and nothing need be said regarding it.

Excision of joints and resection of shafts of bone, now of daily performance, were by no means common at the time of the Queen's accession. True, most of the articulations had been cut out during the last century,⁶ but it was not till Syme published his book in 1831, giving an account of his results in shoulder and elbow operations, that the practice became general. Syme says that in 1826 amputation at the shoulder was the rule for disease of the head of the humerus; and even as late as 1844 Fergusson says excision of the elbow had not been done a dozen times in London. Syme afterwards—as Langenbeck also—removed the scapula as well as the head of the humerus rather than amputate the arm. In dealing with the knee-joint, however, Syme failed, and it was reserved for Fergusson and his pupils, with Jones of Jersey, after 1850, to secure, amidst much opposition, that assured position for excision of the articulation which it now possesses. Better results will doubtless be obtained when there is greater experience in the recently suggested plans for fixing the bones by pegging, wiring, dividing the patella vertically or longitudi-

⁵ The microscope in 1835 discovered for the first time the acarus scabiei and drew attention to the important kingdom of parasites. After that time the achlorion Schönleinii, tænia, trichina, the filarie, etc., were demonstrated, and their clinical aspects investigated. Marshall Hall's great discovery of reflex action, and the chemistry of the urine as applied clinically, also date from a period subsequent to the Queen's accession.

⁶ The head of the humerus by White in 1768, the knee by Park in 1781, and the elbow and ankle by Moreau in 1797.

nally, and afterwards wiring the sections. That excisions were in little vogue even as late as 1860 is evident from the statement of Fergusson, that at St. Bartholomew's the elbow had only once been operated on, and the knee never in that great institution till that date ("not a breath, not a pen, not a knife stirred in England on the subject").

Humphry's important researches between 1858 and 1862 on the growth of the long bones, contributed largely to the development of this question. In Germany and America much was done between 1830 and 1850 in excising joints, and most of the practical points connected with the subject were then worked out. The application of De Morgan's solution of chloride of zinc was a no mean contribution to the surgery of bone. We all know that even in the most unpromising cases much can be done by perseverance and patience, and sometimes by renewed excision; and the sharp spoon of Volkmann has in this, as in other operations, proved most serviceable. The emptying of the epiphyses (first used by Sédillot on scientific principles in 1858), the sparing use of the saw, and the careful discrimination of diseased from merely changed structures have greatly advanced excisions in these later years. The subperiosteal method (first suggested by Heine, of Würzburg, in 1846), though preserving not only the reproductive tissue, but also the insertion of the tendons, has been less used than was expected, partly because of the difficulty of accomplishing it in some cases, and in others from the excess of new bone formed becoming an embarrassment. Researches on the functions of the periosteum have been most fruitful since 1858, and have, combined with antiseptics, led to great freedom in dealing with diseased bone; while osteotomy, though from early times applied to rectify vicious repair, false joints, and ankylosis, has, within the last twenty years, acquired a high importance as an orthopædic recourse from the practice of Annandale, Ogston, and above all, Macewen. No fact in modern surgery is more remarkable than the absence of all local and constitutional disturbance after these operations. To Adams, Sayre, Barton, Buck, and Esmarch, we owe various valuable additions to our operative resources within recent times.

Phosphorus necrosis, the result of the manufacture of the lucifer match, which has been signalled as one of the important discoveries of the Queen's reign, was first noticed in Germany in 1843, but both it and "looking-glass makers' necrosis" have been happily stamped out within the last few years, mainly by improved methods of manufacture.

Operations on the jaws, which were so much dreaded fifty years ago, that excision of either bone was not infrequently preceded by the ligature of one or both carotids and by tracheotomy, are now performed with very little hesitation or risk. In 1844, both upper maxillæ were removed for the first time by Heyfelder, and in 1842 Maissonneuve excised both lower jaw-bones. The method adopted by the latter of twisting out the bone has facilitated and diminished the risk of the operation. Fergusson did much in this department to limit the amount removed, and to retain the more important parts of the framework as the floor of the orbit and the base of the lower jaw. The temporary displacement of both the upper and lower jaws has been practised since 1837 to give access to pharynx and palate.

Much good work has been done in all countries regarding the anatomy, pathology, and treatment of diseased joints, since Brodie first dealt with the subject in 1818. Richet added much to our knowledge by his treatise in 1844. Hip-joint disease has been specially elucidated since 1840; while during the twenty years subsequent to that date, Bonnet's most important observations were published. He combined in a remarkable manner experimental and clinical research to explain the physical signs of joint ailment, and defined the proper stage and limits of rest and passive motion in their treatment, as well as the operations for removing resulting deformities. His work marked a new starting-point in this department.

Within the last thirty years, the forcible rupture under chloroform of adhesions in joints (a practice borrowed from the bone-setters) has been much employed, as well as the free division subcutaneously of contracted structures. For the restoration of stiff joints, for rigid or irregularly contracting muscles, as well as for the removal of passive effusions, and strengthening weakened circulation and innervation, the value of massage is at last recognised in this country; and, though it threatens to become a fashionable hobby, yet it is, when properly employed, and especially when combined with the douche and electricity, capable of affording most valuable results. Inventive skill has provided us within the last few years with many useful splints for joint affections, and

those of Thomas, Sayre, and Bryant are well worthy of mention, as is Scott's mode of treating chronic thickenings which has come into use within the half century. In connection with bone affections, I shall merely mention osteitis deformans, described by Paget in 1877, and that form of neurarthritides which Charcot recognised and described; since which the dependence of certain joint affections on disease of the nerve centres and nerves has become well understood.

Tenotomy is practically another conquest of the last half century, as it was only in 1831 that Stromeyer perfected what was before a most incomplete process, and made it applicable to many uses.⁷ In 1835 Dieffenbach's work on club-foot showed how great had been the advance since Scarpa wrote in 1804. Little's book in 1837 started the practice of tenotomy in England. During recent years greater liberty is taken in the division of structures, but the antiseptic system has emboldened operators to adopt methods, some of which are both unnecessary and retrogressive, as in the open plan of treating club-foot. The excision of the astragalus, however, or the removal of a wedge from the tarsal bones may possibly be necessary in some very bad cases.

By the untimely and tragic death in 1832 of Delpech, who had established at Montpellier the first hospital for its practice, orthopædic surgery lost one of its greatest advocates. For a time subcutaneous operations ran much risk of abuse, especially in the hands of Jules Guérin, who in 1840 is said to have divided forty muscles, tendons, and ligaments in one patient! The extraction of foreign bodies from the knee had then been rendered comparatively safe by the subcutaneous method. In 1851 it was stated at the Surgical Society of Paris that thirty deaths had resulted in 135 cases operated on by the open method, but now antiseptics have enabled us to revert with success to the old plan again; and Annandale's recently-described proposal to suture loose semi-lunar cartilages is another triumph in the same direction. I may add to what has been said that Adam's observations on the regeneration of tendons (published in 1860) was a most important contribution to the progress of tenotomy. I shall not delay to allude to operations on the cleft palate, though all that has been done of value in that department may be said to date from 1840, but will pass on to remark that plastic or reparative surgery, both in its auto- and hetero-plastic forms, though long ago borrowed from the practitioners of India and Italy, took no root in Europe till after the large and varied experience of Dieffenbach was published, when many processes dealing with lost, deformed, and contracted parts came into use with most gratifying results. Ollier's suggestion to retain the periosteum in rhinoplastic operations has not met with much favour. The successful repetition in recent years of the Tagliacozzian operation by Mac Cormac and others is worthy of note, as is the proposal to replace the nose from the integument and even from the bone of the finger.

I cannot avoid mentioning that the plan of restoring the lower lip from the chin, so often ascribed to Syme, was first described by Professor Andrew Buchanan of Glasgow in 1841.

Within the half century aneurysm has been much studied in all its aspects, and its treatment has been simplified, though the methods of dealing with it have been greatly multiplied. It has been shown to be curable by the rapid coagulation of the contained blood, and not alone by the lamination of fibrin and contraction of the sac, a fact long denied; and this has suggested some of the most recent methods of dealing with it. Up to 1842, when the Dublin surgeons laid down the proper mode of using compression, and improved the mechanical means of carrying it out, it may be said that the ligature was alone employed, for though compression in some form (on the surface of the tumour, or within it after it was opened, or over the whole limb, or proximal or distal to the sac separately or combined) had been long in use, it was on a wrong principle, as the whole current was stopped, and inflammation intentionally produced in the vessel. But whether applied by instruments or the hand (Vanzetti, 1846), the modern method, up to a very recent date, aimed at not entirely arresting the blood flow so as to promote a deposit of fibrin. This dates from between 1840 and 1850. The enthusiasm with which it was pursued for some years has been hardly maintained, from the difficulties attending it, and its not infrequent failure. In some positions, however, it will be always employed; and the remarkable success in abdominal aneurysm obtained by Murray (1864), and in iliac

⁷ Hunter divided the tendo Achillis for purely experimental purposes, and in 1784 it was cut in the human subject, as the sterno-mastoid was in 1822, but in neither case subcutaneously, as that term is now understood.

aneurysm by Heath and Mapother, applied to the proximal side under chloroform, has been most encouraging.

The method of applying the ligature, which was the great achievement of Hunter (1785); together with the practice of Brasdor and Wardrop (1825-1827) and Anel have been again much discussed of late years, and distal deligation has been frequently applied with signal success. Antiseptic buried ligatures, with antiseptic dressings, have again placed the use of the ligature in the ascendant, though it would be difficult to excel the success of Syme, who tied the femoral thirty-five times with only one failure before the modern methods were introduced. Since 1852, when Thierry used flexion at the elbow, Mr. Hart and others have applied it to small firm aneurysms of the popliteal with marked success (1858).

Galvanism, first used by Phillips in 1832, was unavailing for aneurysm till Pétrequin (1845) and Ciniselli improved the apparatus and the methods of employing it. Of less important plans we have had introduced since 1837: Fergusson's somewhat dangerous "malaxation;" Blake's displacement of clots by cataract needles; electrolysis with fine needles; acupuncture, now used by leaving gilded entomological pins for days in the sac; acupressure to the main vessel; coagulant injections (ergotine by Langenbeck in 1869, perchloride of iron, alcohol, acetate of lead, tannin, various acids, etc.); foreign bodies, as iron wire, horsehair, etc., passed into the sac (Loreta) or combined with galvanism (Barwell). These plans have been chiefly used when the aneurysm was so placed as to be inaccessible to the more reliable methods, and a certain amount of success has attended them. Syme's most remarkable recurrence to the "old operation" of opening the sac cannot fail to be chronicled when speaking of aneurysm. His operations on the carotid, axillary, iliac and gluteal arteries were brilliant examples of bold and skilful practice. Perhaps the most striking, because most easily applicable and novel plan of treatment is, however, that introduced by Reid (1875), namely, emptying the limb entirely of blood by the use of Esmarch's bandage and cord, while the sac is kept full, so that coagulation *en masse* may take place, and subsequent consolidation be induced. That *in favourable cases* no harm arises either in the limb or within the body, though the treatment is kept up for hours, and, finally, that a *cure* is effected, are points of surpassing interest.

Finally, I may note that the confidence of the profession in the iodide of potassium has increased of late years as an internal remedy in aneurysm; and that the sedative effects of the bromide of potash are found of great service. On the whole subject of aneurysm, Broca's great work, published in 1856, is complete up to that date.

Modern research has greatly advanced the pathology and treatment of fractures and dislocations. Between 1847 and 1855 great attention was bestowed on these accidents. Astley Cooper's pioneer work (1822) did much for the elucidation of these subjects, which were then involved in great confusion; but it is to Malgaigne (1847) more than to any other man, and after him to Smith of Dublin, Hamilton of New York, and Gurtl of Berlin (1860) that we owe our present accurate knowledge. Nothing could excel Malgaigne's systematised and exhaustive researches. Treatment by weight and pulley of fractures of the lower limb, introduced in its present form from America in 1867 (but in use forty years previously) is a distinct improvement over the cumbersome long splint.

"The immovable apparatus" of the Arabian and Greek surgeons, as varied and improved since 1834 by Seutin, Dieffenbach, and others,* gives us great advantage in dealing with fractures. Many "mouldable" materials too (such as poro-plastic and gutta percha), which from their lightness and close application to the part are of inestimable service, have been added to our resources of late years. I would ask your attention to the ratchet, as seen in use in our hospital. I have used it for twenty-five years in the treatment of fractures of the femur and in that of hip-joint disease. It is a simple and most efficient method of applying and regulating extension. Salter's cradle (1864) and other ingenious methods of suspension have also been added to our means of treatment, and, from one cause or another, it fortunately happens that now ununited fracture and vicious union have nearly disappeared. Antiseptics and wiring the fragments have enabled surgeons to do away with the many methods of treating ununited fracture which before prevailed. Compound fractures have also lost their danger and rarely lead to amputation.

* Plaster-of-Paris, starch, glue, silicates, dextrine, paraffin, gum and chall, paper and starch, etc.

As to dislocations, the great achievement of the era is the substitution of manipulation for force in their replacement. This has been erroneously supposed to be a wholly recent idea, and to have originated in America. Not only did Hippocrates and Paulus Ægineta describe it, but Pouteau and Scultetus, and latterly Collin (1832), Desprès, and others both used it and described it accurately. Undoubtedly it has only recently become properly appreciated, and now it is universally employed. The use of anæsthetics has largely contributed to our means of replacing dislocated bones, and has entirely done away with the many "adjusters" which were at one time in vogue. We have with advantage adopted from the bone-setters the practice of freely breaking up adhesions formed in joints kept too long at rest, employing at the same time, if necessary, the subcutaneous division of contracted structures. "The mechanical tonic" of massage is in such cases also invaluable.

The surgery of the genito-urinary organs has been greatly pursued since 1837, and the mechanical appliances for treatment much improved. The pathology of stricture has been carefully worked out, and the treatment fitted for each variety discriminated. Smooth and reliable bougies, from the fine filiform size to the great bolts used by the Americans, can be readily obtained, and dilatation becomes more easily managed. Internal and external urethrotomy, though neither of them new (the former dating from Ambroise Paré and the latter in one form from the Arabians), have been so improved by modern mechanical instruments as to have given us, in a large measure, the command of those troublesome affections. Electrolysis, too, has again come into use in strictures, with more promise of success. Syme's operation, first published in 1844, has proved most useful in the worst cases; and Wheelhouse's improved *boutonnaire* has simplified a very difficult operation. Of urethrotomies there are no end, some cutting from before and some from behind, while others combine rupture or stretching with incision. Perrève in 1847 gave us the best instrument for rapid dilatation. Though using it frequently I have never seen any harm follow, while it has proved most serviceable in limited recent contractions.

I may remark in passing that the bougie-à-boule has supplied us with so valuable an instrument for recognising the position and closeness of a urethral stricture, that no surgeon should be without it; and that the catheter coudé, if widely known, would, in my opinion, save many lives, as it allows an almost unobstructed man easily and quickly to relieve retention from enlarged prostate, when he would be baffled, or cause irreparable harm, with the ordinary instruments.

When chemistry had demonstrated the composition of urinary calculi it was hoped that their solution within the body would be shortly accomplished with the same ease as it was attained in the laboratory. After many and varied attempts in different countries this has been abandoned, as has also the use of galvanism alone or with chemical solvents. At present this hopeful field of research may be said to remain barren of results.

In 1813 a Bavarian surgeon combined lithotripsy with galvanism, and used large straight catheters for evacuating the *débris*, which by his drills and "bruisers" he produced, but with no good result. This, however, was the dawn of lithotripsy, which now threatens to displace in most cases that lithotomy which, under various forms, has been in use for 2,000 years, and about which over 1,000 treatises have been written. Elderdon, of Edinburgh, described in 1817 the first lithotrite. Since then that instrument has been enormously improved in simplicity of action, form, and strength, chiefly by English makers, so that now it is capable, even in the smaller sizes, of breaking all but the hardest stones. The instruments used in the early days of lithotripsy by Leroy, Civiale, and Heurteloup were very complicated and varied. Some had even twelve branches for grasping the stone, and each stage of the operation needed a different instrument.

For over fifty years lithotripsy has been gaining ground, and since 1878, when Bigelow introduced his litholapaxy, the whole practice has been so changed as to constitute an entirely new operation. The greater capacity of the urethra which Otis demonstrated; the immensely greater tolerance of the bladder to the presence of instruments which Bigelow showed to exist; and the improvements in the apparatus for breaking up and removing the fragments, together with the use of anæsthetics, have all combined to establish the triumph which has undoubtedly been achieved. The extension to young boys (even to infants, as has been lately shown) of the advantages of lithotripsy has also been attained, so that great size and extreme hardness are almost the

only obstacles which now stand in the way of its universal application. With a better knowledge of the causes which produce calculus, an earlier recognition of its presence, and the modern system of removing it entirely at one sitting, it may be said that one of the greatest of human calamities has been nearly overcome.

Lithotomy had attained to great perfection before 1837, in the hands of many surgeons in all countries, and in none more than in Scotland. The "methods" employed in different schools were very numerous, though the lateral operation, performed with the gorget or the simple knife, was that most followed in Great Britain. Very many modes of opening the bladder were in use in France, and there the now popular hypogastric operation originated (with Franco in 1561), an operation which by the use of antiseptic dressings and Petersen's (1880) rectal bags (suggested by Garson's experiments on frozen bodies in 1877), has been reintroduced as practically a new operation. The suprapubic method was largely practised by Cheselden and Frère Côme, who by the way used a perineal drain.

It is unnecessary here to allude to the many methods which have been used within the last half century for opening the bladder—the median, with or without the use of the lithotrite; the bilateral; the medio-bilateral, now largely used in France; the recto-vesical—have all had their advocates, but in this school the rectangular plan of the late Professor Andrew Buchanan (1848) is now almost exclusively employed, and is, in my opinion, the simplest, safest, and best method that has ever been suggested, as it provides the most direct access to the bladder, and is so simple that the least experienced may perform it with confidence. The only objection which has been advanced to the rectangular method is the difficulty of introducing the staff. This I venture to say has been wholly overcome by an alteration in its construction, of which I published an account in the *JOURNAL* of your Association in 1877; and I shall have much pleasure in showing it and the mode of its employment to any of your associates who may be interested in the subject. In connection with the genito-urinary organs, I may add that it was in 1834 that iodine injections in hydrocele were introduced into European practice by the late Sir Ranald Martin, and that at first their use was much opposed. Iodine injections, however, were quickly extended to the treatment of fluid collections in all parts of the body,⁹ and now it constitutes, for many purposes, one of our most valued resources. For spina bifida, as is well known, the combination of iodine with iodide of potassium and glycerine, introduced by Dr. Morton, of this city, has proved by far the most useful and efficacious of any of the plans of treatment in use.

I cannot leave this part of my subject without at least referring to the remarkable advances which have been recently made in the surgery of the kidney; the confidence with which it is now stitched to the parietes when movable or opened for drainage or for extracting a stone (Morris, 1880), and the safety with which it has even been entirely removed (first by Simon, of Heidelberg, in 1869), has contributed to the solution of most interesting physiological as well as surgical questions. Then the ready removal of some growths from the bladder by perineal or suprapubic incisions, and the admirable results got by MacCormac and others by suturing the ruptured bladder (an idea thrown out by Benjamin Bell in 1789) and cleansing and draining the pelvis, are clear and important gains to practical surgery.

During the last half century venereal diseases have received great attention and a new interpretation. Ricord, in 1838, by his experimental proof of Tode and Bell's views regarding the distinction between gonorrhoea and syphilis, removed the confusion which long followed Hunter's teaching on that point; but his views on the unicuity of the virus were overthrown by the researches of his pupil, Bassereau, in 1852, and the Dualists were left entire masters of the field, Ricord giving his adhesion to their doctrine in 1857. Now Mr. Hutchinson proclaims that doctrine as "dead," and the soft sore as being due to the inoculation of syphilitic pus, in which there is no virus, or in which its active qualities are destroyed. There can be little doubt but that constitutional disease often follows sores in which there is no characteristic hardness of base; but specific hardness, if present, is still of the utmost clinical significance. Thus, again, the question of whether there be one or two primary poisons has come into discussion, the

knowledge now possessed of the effects produced by the inoculation of mere inflammatory products giving a new complexion to the question; while the dependence of both syphilis and gonorrhoea on micro-organisms is the growing conviction of many.

It was in 1857 that Clerc showed the different effects produced by the inoculation of the true chancre on persons already affected, and those who had not suffered from the disease, and two years afterwards the contagiousness of secondary, and even some tertiary, lesions (which had been wholly denied by Ricord, though to a certain extent proved by Wallace, of Dublin, in 1835) was amply confirmed. The communicability of the disease in vaccination came out in 1860. For a few years after 1850, syphilisation attracted much attention, but it was soon seen to be founded upon an entirely false interpretation of facts, and the doctrine has long disappeared.

In the treatment of the later stages of constitutional syphilis, a great change has taken place in late years by the replacement, in a large measure, of potash by mercury. When Wallace, in 1836, and Ricord subsequently, showed how efficacious the iodide (which Brera had introduced into practice) was in dispersing the later manifestations of syphilis, a great gain was undoubtedly made, especially at a time when mercury was so much abused; but with improved and, above all, restricted modes of administration, mercury is now most trusted to combine with quinine, iron, and other tonics to overcome the final assaults of this protean disease, and that even in scrofulous and unhealthy constitutions. Syphilis has, within my own recollection, greatly diminished in frequency and violence, though I think its commonness and its pernicious influence as an inherited ailment is far greater than is generally supposed. That the subcutaneous method of administering mercury, which some advocate, is not fitted for the long course of treatment now recognised as necessary for the eradication of the disease may, I think, be admitted, and that in private practice neither inunction (though greatly improved by the use of the oleates) nor moist vapour, can compete with the internal use of mild forms of the drug is, I think, equally certain. We owe much to the teaching of Mr. Hutchinson in this direction, as well as to his instructive views on the influence of idiosyncrasy in syphilis and in the action of the remedies employed in its treatment. Much clinical research is still required on many points, especially on the congenital forms of the disease, before the subject is thoroughly understood. Since Diday wrote in 1856, great advance has been made, and a vast body of observations have been recorded regarding the syphilis of internal organs, and the countless forms in which the acquired and hereditary malady affects the various tissues of the body.

In recording the improvements in surgical practice in the department of the genito-urinary organs, I would very shortly note the greater command we now possess over fistulae in the male and female organs, brought about by improved manipulative methods. These improvements date chiefly from 1839, when Hayward, of Boston, took up vesico-vaginal fistula, and Marion Sims and Bozemann introduced wire sutures, covering plates, improved specula and the knee-elbow position. The labours of the unfortunate Jobert de Lamballe in this department should not be forgotten.

The surgery of the female reproductive organs is an immense subject, and has risen to the highest repute well within the half century, and has recorded triumphs of the highest importance to the comfort and life of thousands. Very many operations have been performed for the first time within the last few years, and others have been brought to great perfection. It has been unquestionably the extraordinary success of ovariectomy which has led to the rapid progress of abdominal surgery. We claim for Houston of this city (1701) the pioneer place in ovariectomy, though his operation was but the draining, and not the removal, of a cyst. McDowell, of America (1809), to whom the initial step is usually ascribed, and who operated, in all, thirteen times, was admittedly incited thereto by the teaching of John Bell, of Edinburgh, whose pupil he was. Lizars, of Edinburgh, operated repeatedly about 1825, and Clay afterwards continued the practice amidst disappointment and obloquy. Certainly ovariectomy was on all sides met with ridicule and contempt! In 1823, Boyer says, "the least reflection suffices to show the dangers and impossibility of this operation which has never been performed, and which never will be," and its position, shortly before it was taken up by Sir Spencer Wells (1857-59), is best shown by quoting Sir W. Lawrence's query whether it could be any longer pursued, "without

⁹ By Bonnet, in 1839, to the joints; by Velpeau to hernia; by Dieulafoy to the abdomen; by Brannard to hydrocephalus; by Aran to the pericardium; and by others to affections of the chest.

damage to the character of the profession." It is undoubtedly to the experiments of Wells on the union of serous surfaces and drainage, and subsequently on the command of bleeding and the treatment of the pedicle that we owe the present position of the operation, though others have done much to make it not only a justifiable but an eminently safe operation, when the disease is early recognised and a careful aseptic condition assured. I may say in this connection, as it has a bearing on some discussions which have taken place, that when during operation the contents of a cyst have escaped into the abdominal cavity, I have on eight occasions repeatedly poured from a kettle a 1-40 hot solution of carbolic acid into the belly, turning the patient on her side, so as to allow it to escape, and that of these cases seven recovered without any annoyance whatever. Almost all my cases in recent years have been operated on in the public theatre of the hospital, and without any special preparation—a very different affair from the elaborate and fantastical precautions still sometimes pursued abroad. The plan of twisting long pedicles, as I described some years ago, succeeds perfectly, but as the ligature and cautery combined have been so effective and reliable, I now prefer them in all cases.

Many most important operations in obstetric surgery have been introduced of late years, but these lie beyond my present theme.

Cysts connected with the liver and peritoneum; abscesses in the abdomen; fluid in the Fallopian tubes; extra-uterine foetation; excision of portions of the bowel; intestinal obstruction; cholecystotomy (Sims, 1878); improved Cæsarean section; and many other grave operations have been frequently performed, especially in America, within the last ten years. The recent remarkable results obtained by Apostoli in the treatment of fibroids and other uterine ailments by galvanic-chemical cauterisation cannot be passed over in silence, as a painless, safe, and manageable method of removing some very terrible ailments has apparently been attained by him, and the appliance is capable of extension to other surgical affections.

Colotomy, though suggested by Callisen in 1800, was really not put into practice till 1839, when Amussat, meditating on the death of Broussais from cancer of the rectum, determined to reintroduce it, notwithstanding its condemnation as impracticable by both Dupuytren and Velpeau. We all know how serviceable and simple the proceeding is, and we also feel grateful for the important addition to our resources in intestinal obstruction which Nelaton has made by his operation in the right groin.

Pathological research has done much within the half century as to the large and important subject of new growths. Much, however, remains to be done. Since Müller, in 1838, brought neoplasms within the pale of the cellular pathology, and Virchow added so much to our knowledge, innumerable workers, aided by many new or improved mechanical contrivances and beautiful methods of preparing sections for microscopic examination, have turned their attention to the subject. A simpler classification and arrangement have resulted, with a better understanding of the clinical progress and results of tumours. That carcinoma and tuberculosis are specific diseases due to a microbe seems to be accepted. That cancerous tumours are due to *materies* or virus in the blood, arising from congenital or acquired causes, and that the local outbreak is induced by some occult weakness of the part is generally admitted; but it is by no means proved, as some would allege, that the disease is at first wholly local, and consequently capable of eradication if early enough removed. On the contrary, my own experience, which has been large, tends to confirm the view that cancer, if once present, defies our efforts to cure it either by operation or any other means. From the simplest to the most "malignant" growth, the gradation is one of degree. We can extirpate and cure the lower or simpler forms, but the more complex defy us. The prior existence of a cachexia to the outbreak of cancer has now been abandoned in theory, as it has long been in common experience, and the later constitutional empoisonment is explained on the ground of the non-exhaustion of the virus in the local outbreak, or the multiplication of the micro-organisms and the contagion of the morbid elements within the body. The first note struck in the modern theory of cancer was by Sibley in 1839. Cohnheim's "inclusive" or embryonic theory has now been before the profession for some years; and the heredity of neoplasms has been much but inconclusively debated. If any good is to follow operation in cancer, it must be from a very free and complete ablation, and antiseptics admit of this without increase of danger. The kelectome of Bouisson, the

steel needles of Ciniselli, and other recent inventions permit the examination of the intimate nature of growths before operation.

In no department of surgery has so much that is new and notable been achieved as in injuries and affections of the head. Much has been done both by experiment and clinical observation in the localisation of the phenomena of motion and sensation, and though much remains to be done which can only be cleared up by long and accurate research, still results have been garnered sufficient to give a confident hope that before long a complete and reliable map of the brain will be at the service of the practitioner.

The brain areas which supply the face, the tongue, the limbs, and the muscles of respiration have been clearly defined by British and foreign physiologists. Clinical observations on man have supplemented experiments on animals, and already fruitful practical results have been obtained, so that the trephine has again come into use, but on far different grounds from those theoretical ones which guided its application at the beginning of the century. The first operation for the removal of a cerebral growth planned on the modern physiology was performed so recently as 1885. The new American perforator is much more precise and speedy than the old trephine, especially when worked by the "surgical engine," which has been invented for driving saws and perforators.

In the treatment of affections of the spinal column, Sayre's plaster jacket and its modifications have greatly helped treatment, as have also the systematised exercises of the Ling and Roth methods in lateral curvature.

The improved laryngoscope of Czermak (1858) and Türck, which was the legitimate outcome of Babington's "glottiscope" (1820), and Garcia's instrument of 1854, has been invaluable in affections of the throat and nose. It has admitted of instrumental and other treatment (as in the case of the late lamented Emperor of Germany) which was before impossible.

Excision, partial or complete, of the larynx dates from 1866, and has now been many times repeated with increasing success, though its adoption in simple growths seems indefensible. Intubation of the larynx is another interesting subject which promises important results.

Amputation of the tongue has reached its acme of simplicity in Whitehead's practice with scissors, a bold proceeding rendered possible by the improvement in mouth-gags. I have been accustomed to use the *écraseur* or the thermo-cautery, and am not inclined to abandon them, as they have proved reliable instruments in such serious operations.

Numerous improvements have been made in operations on the palate, and in the construction of substitutes for it (especially those by Kingsley, of New York, since 1844), as well as in the closure of hare-lip, but time prevents me referring further to them.

External (Watson of New York, 1884) and internal (Maison-neuve, 1861) division of undilatable stricture of the œsophagus are proposals of recent years; while gastrostomy, first suggested in 1837 (the year before the celebrated case of St. Martin allowed the subject of digestion to be carefully investigated), has been rendered infinitely more safe by Howse's proposal to secure adhesion between the stomach and the parietes before opening the viscus.

The draining of cavities in the lung has been added recently to our operative and curative resources with encouraging results. The difficulty lies more in an exact diagnosis of the position of the cavity than in the risk of the operation itself, for when there is but one to deal with, and it lies at the base of the lung, and the pleura is adherent over it, the operation is comparatively simple, for not only is mere puncture of lung tissue found to be attended with little danger, but even the removal of a portion of the organ ("pneumonecomy") has been suggested, and in one case partially carried out, in the excessive zeal of our time for sensational operations.

The whole subject of empyema has been carefully studied within the last few years, and the operation and its subsequent management by drainage and cleansing greatly advanced. Resection of the ribs ("thoracoplasty") and of all unyielding structures, so as to admit of more complete draining and collapse of the cavity, which was a startling suggestion only five or six years ago, is now frequently and successfully performed, and has been the means of saving not a few lives which otherwise would have been slowly and hopelessly destroyed. This proceeding Estlander has systematised, and the operation often goes by his name. How

great is the change of opinion as regards the operation for empyema since the time of Dupuytren, who preferred to die rather than submit to the risk of having his chest tapped!

Reference has already been made to some of the more important operations which are performed on the abdomen, but there are many others which have attracted attention in recent times which I will at least mention. Splenectomy, an old operation, has been revived since 1849 with greater prospects of success when performed with modern appliances and care. The pylorus, which was first excised by Péan in 1879, has now been frequently excised and dilated by Billroth and others; while various substitutes for pylorotomy, such as gastro-enterostomy (first performed by Woelfler in 1881); duodenotomy and jejunostomy have been put in practice. Colectomy, cholecystectomy, and cholecystotomy are also available operations, and many other proceedings have been attempted with more or less success. Complete excision of the rectum is still on its trial. It, too, dates only from 1838. My own experience of it shows that it is both easy and safe as an operation, but is of little abiding benefit. Laparotomy, now so frequently had recourse to, is justifiably employed even for exploratory purposes. After all penetrating wounds, or even after injury without a wound where there is reason to fear that bleeding or extravasation has taken place, opening the abdomen, securing the aperture by suture, and cleansing and draining the cavity is the recognised practice since Gross suggested it in 1843. In intestinal obstruction and all forms of peritonitis, laparotomy is now the rule.

In no department of surgery has better work been done in our time than in that of hernia. Here the influence of antiseptic surgery has been very apparent, as it has emboldened surgeons to attempt the permanent cure of rupture in a more complete way than could be achieved formerly,—the sac, in whole or in part, being employed to plug the internal ring, where it is secured either within or without the abdominal cavity, and supported by bringing together the pillars with catgut or wire. Such practice provides a more permanent and reliable barrier to the descent of the bowel than the unstable products of inflammation. I have myself obtained the best results when metal sutures were left in the tissues. In working out the radical cure of some forms of hernia and in other directions of practical surgery, my colleague, Professor George Buchanan, has much distinguished himself. Astringent or irritating injections, as the alcoholic extract of white oak bark, used by Heaton and Warren, or the alum of Velpeau, iodine, etc., have claimed some attention. Mere invagination of tissue, or the introduction of foreign bodies as Belma's gelatine; Gerdy's skin of the scrotum; Wutzer's cylinder; caustics; setons, etc., have disappeared for ever. Chloroform and occasionally the use of the aspirator and inversion, have made a larger number of hernia amenable to the taxis. There is less hesitation about early operation, and a permanent cure is now usually secured after herniotomy. The sum of all this means a great and notable improvement.

Many other points of practice, too numerous to be recorded, have been amended in recent times, as the conservative treatment of injuries of the hand, the management of scrofulous masses by excision, scraping and the electro-cautery, and the discriminate use of caustics and the proper field for the various forms of cautery, whether actual, or gas and electric.

The galvano-cautery was first used in England by Professor Marshall in 1850, but to Middeldorff, of Breslau, we chiefly owe its systematic use in a large variety of surgical cases, where its rapid action, manageability, and the very light which it emits can be utilised. It can never, however, replace the knife for the mere division of structures, nor the actual cautery for counter-irritation in chronic inflammation.

Electricity has made great advances as a practical agent since 1872. In experimental physiology, and as a diagnostic and curative agent, Erb's recent work will do much to promote its more precise use. To Duchenne (1855) must, however, belong the credit of having first recognised its importance; and it is probable that, with the aid of improved batteries and the modern "accumulator," better work will be done in the near future.

Among the many ingenious and useful instruments for clinical research and demonstration, the ophthalmoscope stands pre-eminent. Foreshadowed by Babbage in 1847, its present important position in ophthalmic surgery is due to Von Helmholtz, who took it up in 1851, and with Ruete perfected it as a clinical instrument. To it we owe a knowledge of the pathology of the deeper structures of the eye, and the suggestion of various operations

which have proved of the greatest service. The introduction of cocaine, since 1884, as a local anæsthetic, has added largely to the progress of ophthalmic surgery. The otoscope, the laryngoscope, and other similar instruments naturally followed on the construction of the ophthalmoscope, and have been fruitful of good in their respective departments. The sphygmograph, made practically useful by Marey in 1860, realising the idea of Hales (1748), and of Herisson's sphygmometer, has largely aided the diagnosis of many conditions of the circulatory system, and by its pictorial tracings secures permanent records of their variations. The sphygmophone, which professes to render the arterial sounds audible, is still of no practical use. The endoscope, which was much improved by Desormeaux, after 1853, has never attained a practical position from the difficulty of using it, and the limited field to which it can be applied. Recently, however, Leiter, by using the smallest Edison lamp, and improving the construction, portability, and cost, has provided an endoscope which may possibly promote its employment. It is capable of being applied to all the passages and cavities which are accessible from the surface. As yet the splanchnoscope, which, it was hoped, would enable the abdominal cavity to be illuminated by the electric light, has not come to practical application.

The thermometer, first used in medicine by Boerhaave and his pupil, De Haën, has become one of the most important clinical guides in consequence of the researches of Traube (1850), Wunderlich, and Zimmermann. I need hardly say that now not a few ailments can be recognised and complications anticipated by its employment, and that both prognosis and treatment are essentially promoted by its use. Even brain affections are asserted by Voisin of the Salpêtrière to be recognisable by its readings. The aspirator, which was perfected in 1855 by Dieulafoy, is much valued for diagnostic and curative purposes. The *écraseur* of Chassaignac (1850), though received at first with ridicule like many other innovations, is beyond doubt an admirable instrument in dividing vascular structures. The hypodermic syringe, introduced by Dr. Alexander Wood of Edinburgh, is highly valued as supplying us with a more rapid, easy, certain and manageable means of administering many drugs.

The beautiful discovery of skin-grafting by Reverdin, in 1869, provides us with a valuable resource in many difficult cases of delayed repair and deformity. The permanence of such grafts is not, however, as yet fully assured. The transplantation of periosteum, muscle, bone, nerve and even eye tissues has also been achieved of late years under the magic shield of aseptic surgery. Hydrophobia promises to be deprived of its terrors. Extensive burns are no longer dangerous when kept free from pollution, as the intestinal lesions which Curling drew attention to (1842), are now known to be due to septic poisoning. Nerves are stretched, with or without previous exposure, to the relief of many complaints; nay more, divided nerves and tendons also are successfully united by suture. Thermal, chemical, and sea baths have their appropriate domain assigned them. Cod-liver oil and many concentrated foods, easy of assimilation and rendered more so by the addition of digestives, have come into use. Patients are no longer reduced by diet, purging, and bleeding, or blindly over-stimulated with alcohol, but a dietary founded upon their requirements is prescribed before and after operation. The therapeutic advantages of change of scene and climate are fully taken advantage of, as the means of locomotion have been improved and cheapened. Of the innumerable new drugs with which chemistry has endowed us many highly valuable ones have come into general use, while greater concentration and more elegance have been employed in their manufacture. The surgical instrument maker has, by his ingenuity and skill, simplified and improved the surgical armamentarium, and for every purpose has supplemented our manual dexterity.

Last, but not least, sanitation, that great achievement of our nation, has not only rendered more comfortable the lives of our people, but has, in an incredible manner, saved thousands from an untimely grave. In its official and active form it dates only from 1838. Compulsory registration has also introduced order into our records, and amazingly increased the national welfare. In war, too, as the records of the more recent European contests amply show, improved hygiene and the better management of the wounded, notwithstanding the greater rapidity of the manoeuvres of modern war, and the vastly more destructive nature of projectiles, have accomplished marvels. The medical reports of our army and naval surgeons, and those most valuable records of the American army, are models of information upon such subjects.

The Geneva Convention of 1864 and the International Red Cross Association, to which it gave origin, have brought unspeakable amelioration to the horrors of war.

The extraordinarily extended literature of our profession, which in every language makes known the researches of medical men throughout the world, has found expression in Hirsch's great work on the geographical distribution of disease. The International Congresses which have brought men together from every clime to compare their experience have proved how cosmopolitan is our science, though to us the words of Scripture may be fitly applied, that we are "ever learning, and yet never able to come to a full knowledge of the truth." The remarkable subdivision of subjects which has been necessitated by the expansion of every department; the substitution of laboratory for systematic teaching; the use of statistics for generalising experience, are all striking features in modern medical education.

Every collateral science has been made subservient to our purposes. Even the beautiful art of photography, which has been created since the Queen ascended the throne, has been employed, with remarkable advantages, for the record of our labours.

The General Council of Medical Education has been created to govern and direct our organisation, and its influence is already felt and valued. But I must make an end.

Gentlemen,—I have thus, in the limited time at my disposal, and to the best of my power, noted the changes and improvements in surgical theory and practice which have emerged during the last half century. The task I set myself has proved longer and more difficult than I anticipated, as the harvest has been extraordinarily abundant. I am conscious of having omitted much from want of time and knowledge; but I trust I have succeeded in showing that in every branch of the surgical art there has been a wondrous advance, and that the profession to which we belong marches in the very van of the great army, recruited in all climes, whose aim it is to enlarge human knowledge. Such a retrospect as I have attempted make us reverence a profession whose hope and ambition it has ever been to abate suffering without distinction of race or creed. We see how an abiding and ever increasing purpose has run through these long ages, and that while we now rejoice at being no longer bound by the authority and crude doctrines which shackled our forefathers, we can yet honour the traditions of the past, and appreciate the efforts of that great host of devoted men who have, by their unselfish labours built up the famous temple of our art.

AN ADDRESS

ON

THE SURGERY OF THE BRAIN AND SPINAL CORD.

Delivered at the Annual Meeting of the British Medical Association, held in Glasgow, August 9th, 1888.

By WILLIAM MACEWEN, M.D.,

Surgeon to, and Lecturer on Surgery in, the Royal Infirmary, Glasgow; Surgeon to the Hospital for Sick Children, Glasgow.

MR. PRESIDENT AND GENTLEMEN,—Allow me to thank you for the exceptional honour you have conferred upon me, by inviting me to address the British Medical Association on my "recent investigations in Surgery." It would have been more in harmony with my own feelings to bring before such a meeting the work of others, but this the form of invitation explicitly precludes. From among the various subjects which have engaged my attention, it would have been difficult for me to single out one as especially worthy of notice. Fortunately, I was so far relieved from that decision by receiving a very direct hint from one whose position in the Association demands respect. In obedience to that expressed wish, I now venture to address you on the Surgery of the Brain and Spinal Cord—a subject which has been of much interest to me, and which I hope may not prove uninteresting to you. In doing so it is necessary to premise, in the briefest possible form, the history of the evolution of cerebral surgery.

THE SURGERY OF THE HEAD IN THE PAST.

Lesions of the head have at all times held a prominent place in the annals of surgery: much has been done by surgeons before our

day to advance the healing art as applied to this particular region. Their efforts were, however, chiefly directed to the superficial parts, the skull and its membranes, and were exclusively confined to the results of injury. Their operations were simple, undertaken for the most part upon the primitive evidence of direct visual and tactile observation. There is no reference made by them to cerebral surgery, as it is now known. The brain, whose function was at that time little understood, inspired fear; it was intimately associated with the seat of life; it was the "mysterious dome of thought;" it gave lodgment in its recesses to the soul; and was surrounded by all the mysticism which a highly speculative philosophy inculcated. Although surgeons did not share the popular belief that to touch the brain was to induce certain death, yet they had just grounds for concluding that to them it was practically inviolable. It was no want of boldness or lack of manipulative dexterity, in which, indeed, they greatly excelled, that determined this reluctance in dealing with brain lesions. *Post-mortem* examination revealed the fact that many cerebral lesions could have been easily reached, had the surgeon only known during life at what particular part they had been situated. There were two formidable barriers to the advance of surgery in this region: first, the fact that the majority of intra-cranial operations were attended by inflammatory action, which so often proved fatal as to cause surgeons to shun active interference; and, secondly, the brain was a dark continent, in which they could descry neither path nor guide capable of leading them to a particular diseased area, and, did they attempt to reach it, it could only be by groping in the dark. Therefore, they were constrained to confine their efforts to traumatic lesions, and of these to such as afforded external indications of their presence, and which called out clamantly for relief. From the days of Pott to our own, there seemed to be a growing conviction, not only of the impotence, but of the positive harmfulness, of active interference; so that the trephine was regarded as an almost obsolete instrument. Yet, surgery was fully abreast of the physiology of the day. Such was the state of cranial surgery till 1870.

TWO FACTORS NECESSARY FOR THE INTRODUCTION OF CEREBRAL SURGERY, AND HOW THEY WERE OBTAINED.

However wishful one might be to extend the sphere of surgery to the brain, it was necessary first to adopt means whereby immunity from the inflammation which so constantly attended brain lesions could be secured, and secondly, to endeavour to gain a better physiological knowledge, in the hope that light might be shed upon the localisation of cerebral lesions.

In the wards of the Glasgow Royal Infirmary, Lister had formulated the theory, and wrought out the practice of the antiseptic treatment of wounds, and already much had been done to dissipate the fears of surgeons regarding operations practised on other parts of the body. Experience gained by me showed, that not only compound fractures of the skull, but large osseous defects in the cranial vault, accompanied by extensive loss of cerebral substance, were quite amenable to treatment, exhibiting no tendency to inflammatory action, as long as the tissues were preserved aseptic. When this held true of the rough and often septic lesions produced by machinery accidents, how much surer would well planned and carefully executed operations be? This conclusion was subsequently amply confirmed by the results of operations undertaken by me for the relief of injury, in which the brain had to be exposed, and from which detached portions of it had to be removed. In such instances no inflammatory phenomena interrupted the even course of healing. A striking feature of these wounds of, and operations upon, the brain, was the absence of false hernia cerebri, which had hitherto formed such a conspicuous complication of brain lesions in man, and which had so often marred the success of physiological experiments, by extending the zone of irritation, and by the fatal results which ensued. It was thus manifest that inflammation arising from exposure of, and operations upon, the cerebrum, could be obviated under aseptic conditions.

Meanwhile many workers had been sedulously endeavouring to unravel the intricate and complex questions relating to the structure and functions of the brain. Previously the cerebrum was supposed to perform its function as a whole, in the same way as the liver, heart, and kidneys performed theirs, there being no differentiation of function. Broca, in 1861, from observation on human pathology, isolated a particular limited area, as the seat of the faculty of articulate language. This very important in-