Hunterian Society

ANNUAL ORATION

1890,

BY

STEPHEN MACKENZIE, M.D., F.R.C.P.

Sir Andrew Clark

With the Author's kind regards

MEDICINE,

IN THE TIME OF JOHN HUNTER,

COMPARED WITH THE MEDICINE OF TO-DAY.

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Physician to, and Lecturer on Medicine at, the London Hospital, &c., &c.

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MR. PRESIDENT AND GENTLEMEN,

My first and pleasing duty is to thank you for the distinction conferred upon me, by appointing me to deliver this Oration. When I call to mind the many eloquent addresses I have listened to on similar occasions, and refer to the roll of Hunterian Orators (amongst whom was the great physician just passed away, Sir William Gull), I am deeply conscious of my own unworthiness of being the mouthpiece of the Society this evening. But to be associated for ever so brief a period of time with the name of John Hunter is an honour, and to be allowed to do something to keep evergreen the memory of the great man, after whom our Society is named, is a privilege.

It has always appeared to me that on occasions similar to the present, the theme of the Hunterian Orator should be closely associated with the man and his work we meet to commemorate each year, and not a mere peg on which to hang a dissertation on some recondite professional subject. But the life and labours of John Hunter have been so ably, so exhaustively, so interestingly, and so recently dealt with by you, Sir, that they are fresh in the memory of the Fellows of the Society. It is, therefore, undesirable that I should follow too closely in your footsteps.

I must, however, pause to consider why John Hunter is

> "One of the few, the immortal names,
> That were not born to die."

Hunter's claim to immortality is universally admitted, not only within our own profession, but by those competent to judge outside the realms of medicine. One of the most qualified to give an opinion on this point, Buckle, the historian, writes of Hunter, "His powers were so extraordinary, that, among the great masters of organic science, he belongs, I apprehend, to the same rank as Aristotle, Harvey, and Bichat, and is somewhat superior to Haller and Cuvier," and "what Hunter effected places him at the head of all pathologists, ancient and modern."[1] When we come to inquire into the special qualities that rendered Hunter great, we find they consisted in natural and carefully trained powers of observation, unwearying industry in research, and an extraordinary power of utilising his observations in bold and wide generalizations. It is in this last quality that his real greatness consisted, or more properly speaking, in the combination of the three; but it is in the last, his philosophical perspicacity, that he stands pre-eminent. All may imitate his careful and accurate powers of observation, and laborious devotion to study, but none of us can expect to possess that grasp of intellect that enabled him to turn his labours to such good account. Hunter was a great collector, including within the range of his acquisitions, not only specimens of all kinds from the animal and vegetable kingdom, but specimens of various kinds from the inorganic world, as crystals, &c., and also objects which appear to teach no biological lessons, such as armour, coins, &c. His collections were, however, no mere "dust heaps" of facts, but storehouses of information, which both he and succeeding generations have been able to utilise for the good of mankind. The magnificent Museum, acquired by the Royal College of Surgeons, has, under the fostering care of successive Conservators, been of inestimable value to biologists and members of our profession.

"He aimed at nothing less than to unite all the branches of physical science, taking them in the order of their relative complexity, and proceeding from the simplest to the most intricate. With this view, he examined the structure of the mineral kingdom, and, by an extensive comparison of crystals, he sought to generalize the principles of form, in the same way as, by a comparison of animals, he sought to generalize the principles of function. And, in doing this, he took into account not only regular crystals but also irregular ones; for he knew that in nature nothing is really irregular or disorderly; though our imperfect apprehension, or rather the backwardness of our knowledge, prevents us from discerning the symmetry of the Universal Scheme. The beauty of the plan, and the necessity of the sequence, are not always perceptible. Hence, we are too apt to fancy that the chain is broken, because we cannot see every link in it. From this serious error Hunter was saved by his genius, even more than by his knowledge. Being satisfied that everything which happens in the material world is so connected and bound up with its antecedents as to be the inevitable result of what previously occurred, he looked with a true philosophical eye at the strangest and most capricious shapes,

[1] Buckle's History of Civilization in England. Vol. iii., pp. 429 and 447.

because to him they had a meaning and a necessary purpose. To him they were neither strange nor capricious; they were deviations from the natural course; but it was a fundamental tenet of his philosophy, that nature, even in the midst of her deviations, still retains her regularity;—or, as he elsewhere expresses it, deviation is, under certain circumstances, part of the law of nature. To generalize such irregularities, or, in other words, to show that they are not irregularities at all, was the main object of Hunter's life and was the noblest part of his mission. Hence, notwithstanding his vast achievements in physiology, his favourite pursuit was pathology, where the phenomena being more complex, the intellect had more play."[2] His contributions to surgery were no doubt considerable, and one in particular, ligature of a proximal part of the artery in aneurism, has exercised a permanent influence on surgery, and would alone have rendered him illustrious. But his lasting fame rests on his pathological work, and the impetus he gave to the study of pathology. All students of his writings testify to the inspiring character of his works. The late Sir Thomas Watson happily described his "Fundamental Principles of Inflammation" as "a mine in which all succeeding writers have dug."[3] Sir John Simon has admirably expressed his true position in science: "Doubtless, he was a great discoverer; but it is for the spirit of his labours, even more than for the establishment of new doctrine, that English surgery is for ever indebted to him. Of facts in pathology he may, perhaps, be no permanent teacher; but to the student of medicine he must always be a noble pattern. Emphatically it may be said of him, that he was the physiological surgeon. Others before him (Galen, for instance, eminently,) had been at once physiologists and practitioners; but science, in their case, had come little into contact with practice. Never had physiology been so incorporated with surgery, never been so applied to the investigation of science and the suggestion of treatment as it was by this master-workman of ours. And to him, as far as all obligation can be personal, we assuredly owe it that, for the last half century, the foundations of English surgery have, at least professedly, been changing from a basis of empiricism to a basis of science."[4]

Hunter did not meet with the full recognition of his worth from his contemporaries. This was due to various causes; little imperfections from which even the truly great are rarely free, the novelty and apparently unpractical character of his

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[2] Ibid, p. 444.

[3] Principles and Practice of Physic. 1857. Vol. i., p. 146.

[4] Simon. Holmes' System of Surgery. 1st Edition. Vol. i., p. 134.

work, and largely because they were o'ertopped by his genius, and could not reach the giddy height in which his vast intellect soared. "Many a philosopher is little honoured till the future proves his inspiration." The novel character of his studies, and an undoubted obscurity of expression, which his warmest admirers admit contributed to make him difficult to understand. This fault of expression has been traced by different critics to various causes; to his undoubted neglect of his educational opportunities, his want of literary culture, and to the struggle in his mind between the two opposing principles of deductive and inductive philosophy. His deductive tendencies, national and inherited, conflicting with the influence of the practical studies started by his brother, William Hunter, and fostered by his translation from a Scotch to an English soil.

If, however, Hunter failed to receive from his contemporaries the favour and honour his arduous and persevering investigations, his practical achievements in physiology, pathology, and surgery, and his master-mind entitled him to, they have been ungrudgingly awarded him by his successors, and we of the present hand on his name to those who follow us, as one of the greatest connected with our profession. The Hunterian Society was established to perpetuate his name and work. Long may it flourish, and be dominated by his spirit of patient observation and catholicity of mind!

It has seemed to me that I might profitably employ the time at my disposal this evening, by comparing the condition of medicine in the time of Hunter with its condition at the present time; next trace the paths by which progress has been reached; and, finally indicate the probable course of future advance. It is obviously impossible to take more than a cursory glance at the points I have named in the time at my disposal.

Let us, in the first place, endeavour to gain some idea of the condition of the medical profession in the time of Hunter, who was born in 1728 and died in 1793. In doing so I have been greatly aided by the writings and information of the great modern historiographer of the medical profession, a former Hunterian Orator and President of the Society, Mr. Walter Rivington. Confining our attention mainly to London, where Hunter lived a seven years' apprenticeship, and an examination by one of the corporations, were the requisites for a qualification to practise. No certificates of attendance on lectures or of practice, or of a knowledge of practical anatomy appear to have been required, though students were in the habit of "walking the hospitals." The surgeons to the Royal Hospitals, moreover, were in the habit of taking pupils at a high fee, who were not bound apprentices for seven years to members of the Barber-

Surgeons' Company, and qualifying them in a year or even less. For army surgeons one year's study only was necessary for qualification, whilst two or three months' study sufficed for a surgeon's mate. Physicians were educated at the Universities, the Fellowship of the College of Physicians being limited to graduates of Oxford and Cambridge. The general hospitals then in existence were St. Bartholomew's, the Westminster, Guy's, St. George's, the London, and the Middlesex. The education at the hospitals appears, at the early part of the period we are considering, to have been very defective, especially in the teaching of anatomy, largely owing to the difficulty in obtaining subjects. The consequence was that private schools, which paid special attention to anatomy, and were more energetic in getting bodies, flourished. It was at the private school of William Hunter, established in 1746, that John Hunter received his first impetus to work, and where he acquired that love of science which afterwards engrossed his whole attention and energies. He subsequently succeeded his brother William in his house in Jermyn Street, in 1768, when the former removed to the Hunterian School he had built in Great Windmill Street, and where later Matthew Baillie, his nephew, Sir Charles Bell, and other distinguished men taught. John Hunter lived ten years in Jermyn Street, and "as he was engaged in the improvement of his profession, young gentlemen, who came to London to finish their education, were very desirous of living in his house, and several gentlemen, very eminent in practice in different parts of the country, received part of their education as his house-pupils. Amongst these was Edward Jenner, who boarded with him in 1770 and 1771, and lived in habits of intimacy with him till his death."[5] These private schools continued to flourish nearly to the middle of the next century. The general condition of the profession at this time is summarised by Mr. Rivington as a state of intercene conflict; the physicians overbearing, endeavouring to restrain the surgeons, apothecaries and quacks; the surgeons and barbers quarrelling and desiring separation, which was accomplished in 1745; the surgeons fighting against empirics; apothecaries encroaching on physicians, and chemists and druggists on apothecaries.[6] Turning to the teachers and writers on medicine, the ancient doctrines of the four elements and their corresponding temperaments—of the separate functions of the vegetative, sentient, and rational souls—and of the agency of the natural, vital, and animal

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[5] Life of Hunter, by Sir Everard Home, p. xxi.

[6] The Medical Profession, by Walter Rivington, M.S. Carmichael Prize Essay. 1887. Chapter i.

spirits—had continued to be taught in the schools of medicine with very little variation, from the time of Galen till after the middle of the 17th century. But in this century the writings of Lord Byron, Descartes and Locke, the discovery of the laws of gravity by Newton, the discovery of the circulation of the blood by Harvey, and the many anatomical discoveries which characterized the end of the 17th century, had stirred up the minds of the best men of this period. (Dunglison.) We find it was an age of Aphorisms, Definitions, Systems and Nosologies, rather than of descriptions of disease. Medical opinion was dominated by the systems of Stahl, Hoffmann, and Boerhave. Their minds were so burdened by the teaching of schools that they failed to observe the phenomena of disease. If the facts did not harmonize with their theories, so much the worse for the facts. Pharmacology was in an incohate state at the beginning of the century. The edition of the Pharmacopœia of the College of Physicians of 1746 was a great improvement on its predecessor of 1721; but though the number of drugs were reduced, and formulæ simplified, many useless articles expelled from the Materia Medica, and the mode of preparing metallic preparations improved, yet, Mithridatum, with forty ingredients, and Theriaca and Romachi with about sixty, were permitted to remain.[7]

We will next turn to the writings of the medicine of this period, and endeavour to obtain some idea of the knowledge in this department. I shall confine my remarks almost exclusively to the works of Cullen, because he was a man of remarkable ability, and because he, more perhaps than any writer of Hunter's time, exercised an extraordinary influence, and changed the current of medical opinion from a humoral to a solid pathology. "The leading characters of the intellect of William Cullen were great energy, clearness of perception, accuracy in observing, soundness of judgment, logical precision in reasoning and deducing inferences, much originality in all his views, and a remarkable faculty of concentrating information in all points, and making it illustrate the subject of medical pathology and therapeutics."[7a] His Nosology, first published in 1769, and his "First Lines of the Practice of Physic," the first edition of which was published in 1776, attracted very wide attention, the latter being rapidly translated into Latin, French, German and Latin. The comments on it when it appeared by many of the most eminent of the profession in various parts of the world, show it to have been a work greatly in advance of the ordinary treatises of medicine then in use.

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[7] Rivington. Ibid, p. 19. [7a] Thomson's Life of Cullen, Vol. ii., p. 675.

In the first place, we will take in his "First Lines of the Practice of Physic," the edition published in 1784, the subject of diseases of the kidney. We find only *nephritis* fully described. It is stated, "this disease, like other internal inflammations, is always attended with pyrexia; and is especially known from the region of the kidney being affected by pain, commonly obtuse, sometimes pungent This pain is not increased by the motion of the trunk of the body, so much as a pain of the rheumatic kind affecting the same region. The pain of the nephritis may be often distinguished by its shooting along the course of the ureter, and is frequently attended with a drawing up of the testicle, and with a numbness of the limb on the side affected; although, indeed, these symptoms commonly accompany the inflammation arising from a calculus in the kidney or in the ureter. The nephritis is almost constantly attended with frequent vomiting, and often with costiveness and colic pains. Usually the state of the urine is changed; it is most commonly of a deep red colour, is voided frequently, and in small quantity at a time. In more violent cases the urine is sometimes colourless. The remote causes of this disease are various,—as external contusion; violent or long continued riding; strains of the muscles of the back, incumbent on the kidneys; various acrids in the course of the circulation conveyed to the kidney; and perhaps some other internal causes not yet known. The most frequent is that of calculous matter obstructing the tubuli uriniferi, or calculi formed in the pelvis of the kidneys, and either sticking there or fallen into the ureter."[8] Fordyce, writing in 1791, states: "This disease is not common, as a determination of fluids to the kidneys occasions an increased secretion of the urine, sometimes mixed with blood, which prevents the inflammation. A stone in the kidney produces inflammation, but most commonly of the internal membrane and tubuli uriniferi. The inflammation begins with a pain in the region of the kidney (*i.e.* in the back, near the articulation of the short ribs, higher up on the left side than on the right), often shooting down by the ureter to the bladder, and by the spermatic cord to the testicle. The urine is pale, its evacuation frequent and in small quantities at a time, performed with difficulty, and with a sense of heat and pain: there is sometimes external redness. The leg of the side affected is seized with stupor, and the pain is increased by standing, walking, coughing, lying on the opposite side, or in any other case where the kidney is moved, or the surrounding parts extended. The pulse is hard and frequent,

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[8] First Lines of the Practice of Physic, by Wm. Cullen, M.D. 4th edit. Vol. i., p. 387.

and as the pain increases often becomes small, quick, and sometimes intermittent, with coldness of the extremities, cold sweats, sickness, vomiting, fainting, *delirium*, convulsions, &c., as in inflammation of the intestine, although not in so great a degree, or arising so soon in the disease."[9] It is said to terminate by natural cure, metastasis, or in gangrene, which are almost constantly fatal, or to leave a scirrhus, known by temporary relief, without the signs of a natural cure or suppuration appearing, from a sensible hardness sometimes in the part, a *stupor* in the lower extremities on the side affected, and a diminution of the secretion of urine; or the kidney may suppurate. We find thus that all kinds of diseases of the kidney, calculous and traumatic nephritis, suppurative nephritis, nephrophthisis, parenchymatous and interstitial nephritis indiscriminately included, and the treatment is necessarily as confused as the pathology. It will be observed that no mention is made amongst the symptoms of hæmaturia (Fordyce regarding that as preventing nephritis), of dropsy, or of inflammation of serous membranes. Convulsions are not alluded to by Cullen, but Fordyce mentions their occasional occurrence. Cotugno had already, in 1770, published his observations, showing that dropsical persons could pass urine, which, although not blood coloured, might coagulate just like white of egg when heated. The knowledge, however, had not become general, for we find Cullen stating, "We know no state of urine without blood, which shows any portion of it coagulable by a heat equal to that of boiling water, but blood diffused in urine is still coagulable by such heat, and by this test, therefore, the presence of blood in urine may be commonly ascertained."[9a] Neither mention amongst its causes cold or scarlet fever. Again, when dealing with dropsy, especially anasarca, which is treated of very fully, scarcely mention is made of disease of the kidney as a cause. Thus, "It is also said, that an interruption, or considerable diminution of the urinary secretion, has produced the disease; and it is certain, that in the case of ischuria renalis, the serosity retained in the blood vessels has been poured out into some internal cavities, and has occasioned dropsy."[10] Elsewhere he writes, "Anasarca is almost always attended with a scarcity of urine; and the urine voided is, from its scarcity, always of a high colour; and from the same cause, after cooling, readily lets fall a copious reddish sediment. This scarcity of urine may sometimes be owing to an obstruction of

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[9] Elements of the Practice of Physic, by Sir George Fordyce, M.D., F.R.S. Part ii., p. 268. 6th edition. 1801.

[9a] Vol. iii., p. 80. [10] Cullen, ibid. Vol. iv., p. 264.

the kidneys, but probably is generally occasioned by the watery parts of the blood running off into the cellular texture, and being thereby prevented from passing in the usual quantity to the kidneys." [11] In describing scarlet fever, anasarca following the disappearance of the eruption is mentioned, " which, however, in a few days more generally subsides " [12] it is said, but no suspicion attaches to inflammation of the kidney being its cause.

Cotugno's discovery was followed up by Cruikshank, who took the presence or absence of albumin in the urine of dropsical subjects as his guiding principle for distinguishing one form of dropsy from another. Wells had already noticed in his pathological inquiries, certain anatomical alterations of the kidney, to wit, thickening of the cortical layer from deposition of coagulate lymph, in particular kidneys which had secreted albuminous urine during life, but he did not imagine that a kidney must, in every instance, be diseased if it furnished a urine much mixed with serum. Wells, too, was the first observer to show the presence of albumin in the urine of a person who was not dropsical, and had the appearance of health.[13] Blackall, of Exeter, in 1814, pointed out that a relationship exists between dropsy and albuminaria, but he did not observe the condition of kidney associated with them. It was reserved for Richard Bright, a former President of this Society, in 1827, to point out the appearances observed in the kidney in cases terminating in dropsy, and associated with the excretion of albuminous urine; and he inferred that this albuminuria might be accepted as the sign of those pathological changes of the kidney which were besides likely to induce general dropsy. This was the starting point of an accurate knowledge of renal disease, clinical and pathological. Bright's work has been followed up in this kingdom by Wilks, Johnson, Grainger Stewart, Dickinson, Sir Wm. Roberts, Klein, Greenfield, Saundby, Ralfe, Gull and Sutton, until we have reached a state of knowledge on this subject which is surpassed by that in few others, in spite of the great difficulties which baffle knowledge. We are able to diagnose with great precision the exact condition of the kidneys in those suffering from diseases of these organs, and to follow the effects of the disease on the constitution, step by step. The only matters that remain to clear up are certain histological details, and the chemical constitution and effects of the retention in the system of the products of metabolism which the kidneys have failed to eliminate.

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[11] Ibid. Vol. iv., p. 283. [12] Ibid. Vol. ii., p. 195.

[13] Bartels Cyclopædia. English Trans. Vol. xv., p. 35 (Ziemssen's.)

Taking, next, diseases of the chest. Cullen treats of bronchitis (under catarrh), pneumonia, peripneumonia notha (capillary bronchitis and bronchopneumonia). Influenza, from which we have recently suffered, is well described under epidemic or contagious catarrh; asthma and phthisis pulmonalis are fully treated of; and a chapter is devoted to the consideration of Dyspnœa, or difficult breathing. But we find the recognition of the various diseases of the lung and heart very confused and incomplete. Thus, phthisis pulmonalis is defined as "an expectoration of pus or purulent matter from the lungs, attended with hectic fever;" and elsewhere he writes, "In every instance of an expectoration of pus I presume there is an ulceration of the lungs." Great care is taken to avoid the confusion arising from mistaking mucus for pus, and minute and sagacious directions are given for drawing the distinction, by observing, 1, the colour; 2, the consistence; 3, the odour; 4, the specific gravity; 5, the mixture discernible in the expectorated matter; 6, the effects of re-agents; and, 7, the expectoration being attended with a hectic fever. Though the microscope had been invented a hundred and fifty years, it was but little used in clinical medicine. Cullen traced phthisis, 1, to an hæmoptysis, a doctrine later revived by Niemeyer; 2, to suppuration of the lungs, in consequence of pneumonia; 3, to catarrh; 4, to asthma; or 5, to a tubercle. His remarks on tubercle, its relation to scrofula, and its occasional origin in the exanthemata, show keen observation. He points out the occasional production of phthisis by syphilis, and raises the question whether tubercles and phthisis may not be sometimes caused by scurvy and suppressed eruptions. He also traces phthisis to certain dusty occupations, such as stone-cutters, millers, flax-dressers and some others. He discusses the contagiousness of phthisis, but writes, "in many hundred instances of the disease which I have seen, there has hardly been one which to me could appear to have arisen from contagion."

His description of the usual subjects of tubercular phthisis is characterised by general accuracy.[14] Under pneumonia or pneumonic inflammation, it is stated, "Under this title I mean to comprehend the whole of the inflammation affecting either the viscera of the thorax, or the membrane lining the interior surface of that cavity; for neither do our diagnostics serve to ascertain exactly the seat of the disease; nor does the difference in the seat of the disease exhibit any considerable variation in the state of the symptoms, nor lead to any difference in the method of cure."[15] Elsewhere he writes, "I might here,

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[14] Ibid. Vol. ii., p. 356. [15] Ibid. Vol. i., p. 306.

perhaps, give a separate section on the carditis and pericarditis, or the inflammation of the heart and pericardium, but they hardly require a particular consideration. An acute inflammation of the pericardium is almost always a part of the same pneumonic affection I have been treating of, and is not always distinguished by any different symptoms, or, if it be, does not require any different treatment. The same may be said of acute inflammation of the heart itself; and when it happens that one or other is discovered by the symptoms of palpitation or syncope, no more will be implied than that the remedies of pneumonic inflammation should be employed with greater diligence."[16] Syncope is traced to either 1, nervous influences, or 2, to "organic affections of the heart itself, or of the parts immediately connected with it, particularly the great vessels which pour blood into or immediately receive it from the cavities of the heart. Thus a dilatation or aneurism of the heart, a polypus in its cavities, abscesses or ulcerations in its substance, a close adherence of the pericardium to the surface of the heart, and ossifications in these or in the valves of the heart, are one or other of them conditions which, upon dissection, have been discovered in those persons who had before laboured under frequent syncope."[17] Enough has been said to show the general state of knowledge of chest diseases a hundred years ago. At the present day we discriminate between pleurisy and pneumonia or recognise their co-existence, not only so, but we gauge their extent, and follow the progress of the disease, stage after stage, with our mental eye, through the knowledge gained by means of physical examination. We recognise the presence of tubercles in the lung, and in most cases of phthisis can estimate the exact amount of lung involved, and gain an insight into the type of disease present. We are able to say definitely whether or not the pericardium is inflamed, and to ascertain when fluid is present in excess of the normal. We can not only ascertain the integrity of every valve of the heart, but we can almost measure the degree of incompetency when the valves are diseased. We can very exactly ascertain the size of the heart cavities, and the thickness of its walls. The precision that marks modern medicine has been reached by many steps, and by the labours of many workers. The introduction of the stethoscope by Laennec in 1819, gave an impetus to the study of physical signs indicative of disease of the chest, which reveal to us a knowledge of disease of the thoracic organs, probably not even dreamed of in the time of Hunter. Frequent comparisons of the physical signs with the state of

[16] Ibid. Vol. i., p. 353. [17] Ibid. Vol. iii., p. 212.

the organs diseased after death, has led to a degree of accuracy of interpretation of the phenomena of disease of the chest, probably not exceeded in any other department of medicine. Still more recently, and by another development of science, the micro-chemical discovery of the bacillus tuberculosis by Koch, has placed in our hands just the definite information which was wanted in doubtful cases, and by it we are afforded an absolute criterion by which, in most cases, we are able to discriminate between tubercular and non-tubercular processes.

Let us turn to the nervous system. In the First Lines, the following diseases are described: phrenitis, apoplexy, palsy, tetanus, epilepsy, chorea, pyrosis, colic, diabetes, hydrophobia, hysteria, and insanity. In the Nosology, tremor in its various forms, and hypochondriasis, are included. In apoplexy it is to be noted that amongst the various immediate causes, thrombosis and embolism find no place. In epilepsy, *petit mal* is not recognised and heredity not mentioned. In chorea no allusion is made to its association with rheumatism and heart disease. Under palsy, practically, only hemiplegia and paraplegia in their simplest form are described. What enormous advances have been made in this department of medicine since Hunter's time! The discovery by Sir Charles Bell, a pupil of William Hunter and Cullen, in 1811, 1, that nerves similar in their substance and structure, differ in their endowments and functions, as they differ in origin; 2, that the nerves owe to their roots in the great nervous centres (the cerebrum, the cerebellum, the nudulla oblongata, and the spinal marrow), their respective endowments, the one motion, the other sensation; a discovery which has been said to rank in medicine next to Harvey's discovery of the circulation of the blood, was the beginning of an accurate knowledge of the nervous system.[18] This was followed by the discovery in 1832, by Marshall Hall, of the exact nature of reflex action, and his complete working out of the anatomy, physiology, pathology, and therapeutics of the reflex activity of the spinal system; by the patient and ingenious histological labours of Lockhart Clarke, which were the starting point of modern anatomical and pathological investigations of the nervous system; by the philosophical labours of Herbert Spencer; by the minute clinical investigations, and profoundly scientific deductions of Hughlings Jackson, who, availing himself of the labours of the workers in all departments of science, has advanced the knowledge of diseases of the nervous system more perhaps than any living worker; by the invaluable experimental work started by Fritz and Hitzig, and followed up with such

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18 Pichot's Life of Sir Charles Bell. 1860. P. 95.

success by Ferrier, Horsley and Beevor, in this country; by the important clinical and pathological investigations of Erb, of Westphal, whose recent loss we all deplore, of Charcot, of Wilks and Bristowe, Bastian, Buzzard, Gowers, Ross, and many more too numerous to name; and, lastly, by the recent histological researches of Gaskell, which rank nearly with the labours of Sir Charles Bell, and which are destined to greatly influence the progress of our knowledge of the physiology and pathology of the nervous system. The introduction of the ophthalmoscope, in 1851, by Helmholtz, has been of incalculable benefit to the clinical investigator of nervous diseases; and the advances in the application of electricity in investigation and treatment, for which we are indebted to Erb, Von Ziemssen, de Watteville and others, have greatly aided our knowledge of the function and mode of action of nervous matter.

Let us turn for one moment to the subject of rheumatism, and see what was generally known about it a hundred years ago. In Cullen's First Lines, acute and chronic rheumatism are described. Rheumatism is traced to cold and damp; it is said to affect persons of all ages, but that it seldom appears in very young or elderly persons, being most common from the age of puberty to that of thirty-five. The arthritic symptoms, with redness, pain, and swelling, chiefly affecting many of the larger joints, the shifting character of the joint affection, the pyrexia with latiritious deposit in the urine, the almost invariable absence of suppuration, the duration of several weeks, and the rarity with which it proves fatal are all accurately recounted; but curiously it is stated "the disease is attended with some sweating which occurs early in the course of the disease, but it is seldom free or copious."[19] No mention, it will be observed, is made of the occurrence of heart disease in connection with it, or of the severe cerebral symptoms which occasionally arise, and which we now know are usually due to hyperpyrexia. We have learnt a good deal concerning rheumatism since that time, though much remains to be accomlisphed. Compare Cullen's description of rheumatism with the masterly and comprehensive views of the most recent writer on the subject, Dr. Cheadle.[20]

There is only one other comparison which I am able to make between the medicine of the time of Hunter and that of the present day, and that will only occupy us but a few minutes. It is concerning the nature of the specific diseases, animal ferments, and decomposition products of the living and dead

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[19] Ibid. Vol. ii., p. 15.

[20] The Various Manifestations of the Rheumatic State in Childhood, by W. B. Cheadle, M.D., 1889.

body. The general facts regarding contagion were, of course, well known long before the period we are considering. The action of contagion was much discussed, and various opinions held regarding its nature. But beyond the observed facts that the poisons were emanations from the sick or from the soil—human or marsh effluvia—but little was known of their real nature. Still it was observed, "They arise from putrescent matter. Their production is favoured, and their power increased by circumstances which favour putrefaction; and they often prove putrefactive ferments with respect to the animal fluids." We have learnt by successive steps since then, from the labours of Chauveau and Burden Sanderson, that the virus is particulate; and from its power of undergoing multiplication in the body, that it is organized. From the science of bacteriology, only as yet in its infancy, we have already learnt that it is a bacterium, a minute organism not containing chlorophyll, and multiplying by fission. In several diseases affecting man and animal, *e.g.* tuberculosis, glanders, anthrax, leprosy, chicken-cholera, pneumo-enteritis or swine plague, and the silk-worm disease, the complete proof has been afforded that a specific organism is the *causa vera* of the disease. In many others a definite micro-organism has been found to be constantly present in the blood, lymph, or tissues of those suffering from a specific and communicable disease, but some link in the chain of evidence is yet wanting to furnish the certain proof of its being the specific contagium. The analogy of the phenomena in the case of the diseases in which a microbe has been identified as the cause of the disease with those in others of the specific diseases, warrants us in expressing a belief that we are within measure-able distance of the time when the specific micro-organism of each communicable disease will be discovered. We are only on the threshold of inquiries into the nature and action of animal ferments, and of putrescent and pathogenic alkaloids, ptomaines and leucomaines. Already important facts have been elicited, which seem to throw a new light on the nature of the process induced by bacterial action, and the knowledge we have gained on this subject promises important bearings in clinical and preventive medicine.

I have thus briefly and imperfectly instituted a comparison between medicine in the time of Hunter and that of the present day. It is obvious what immense progress has been made. We must next proceed to glance at the means by which it has been accomplished. The work of the two Hunters, especially that of John Hunter, and of a few of their contemporaries, but still more of their disciples and successors, gave a great stimulus to the study of anatomy, physiology and pathology, the only safe foundations of clinical medicine. This has reacted on medical education, which has enormously improved since then. Preliminary education, not very profound it is true, is required of all entering the medical profession. Apprenticeship, in which the evil probably exceeded the good, has been abolished, and the curriculum has been extended and made much more complete. No student can become qualified without giving evidence of a considerable and practical acquaintance with anatomy, and a moderate knowledge of physiology. Systematic teaching of all branches of medical science has greatly improved, clinical instruction reached a high degree of perfection, and the student is required to produce evidence of practical clinical work. The enormous expansion of medical science has led to subdivision of work, and given rise to specialism. Whatever the disadvantages in this seen by some, it has had the effect of greatly increasing our knowledge in many branches, and has led to the formation of special hospitals, and special departments in the general hospitals where the student can gain a knowledge and experience not previously obtainable. The number of general hospitals with medical schools has increased in London to twelve, besides several large hospitals without schools. Nursing has become a finished art. The restless struggles of the profession 100 years ago are ended; the physician and surgeon, like the wolf and the lamb, lie down together, or at least meet as friends and not as enemies, whilst the apothecary has practically become extinct. There are a large number of medical societies doing admirable work in all directions. Thus a general amity prevails in the profession, and though there are still subjects of medical polity on which differences of opinion exist, these are not attended by the acuteness of feeling which formerly prevailed.

What has advanced medicine most, next to the influence of education in its widest sense, has probably been the increased accuracy of observation of modern, as compared with earlier medicine. It has been aptly said by Dr. Buzzard that "science is measurement." It is to the introduction of instruments of precision into daily use in the investigation of disease that we owe, I believe, the increase in accuracy of our observations. In a case of urinary disease of importance, we measure the quantity of urine passed *per diem;* we take its specific gravity, thereby gauging the amount of solids excreted by the kidney; we estimate the amount of urea, its most important constituent; we measure the amount of sugar and albumen when present; with the microscope we detect any crystalline matter contained in the urine, and gain a knowledge of the condition of the kidney when diseased by examining the tissue elements thrown off; we bring the spectroscope to our aid in determining the exact form in which blood is present in the secretion, and detect the presence of other chemical substances alone revealed by it; by the ophthalmoscope we examine a part of the nervous system which reveals to us the tissue changes occurring therein; with the sphygmograph we detect the earliest signs, and estimate the degree of arterial tension and by physical examination of the heart, the consequences of this brought about by failure of the renal functions. The clinical thermometer enables us to exactly ascertain the degree, and to watch the progress of fever. The laryngoscope allows of accurate knowledge, and direct treatment of diseases, which previously could be only conjectured. The ear is explored, audition tested, anomalies of refraction estimated with mathematical precision, and the dark places of the body, as the bladder, made light as day by the electric lamp. The exact condition of the nerves and muscles can be ascertained by electricity. A volume might be written on what the microscope has accomplished in medicine. Apart from what it has revealed to us of the structure of the tissues, healthy and diseased, we could not do our work satisfactorily for a single day without its assistance in clinical medicine. I have alluded to its help in examining the urine. Portions of tumours are removed and examined to ascertain their nature and guide us as to their management; we draw off portions of morbid collections of fluid, and are aided in the subsequent treatment by the results of microscopical examination; an obscure case of gout is made clear by finding crystals of urate of soda in the cartilage of the ear. The exact nature of many diseases of the skin can only be made certain by the microscope, enabling us to detect animal and vegetable parasites. Leprosy, tuberculosis, anthrax and some other diseases are capable of certain recognition by its aid. By it we examine the form and size of the blood corpuscles, and assisted by the hæmocytometer we estimate their numbers day by day. Chemistry has come to our aid in many ways. The exact work of Bence Jones, Owen Rees, Garrod, Pavy, Roberts, Ringer, Brunton, Dickinson, Fenwick and Ralfe, have given assistance to our investigations, and to the proper understanding of chemico-physiological processes. We expect great things from organic chemistry in the future. We study by graphic methods the rhythm of disturbed respirations and cardiac pulsations; and record, time, and measure the quivering of a muscular fibril.

It is unnecessary to further particularize the direct advantages instruments of precision have been to clinical medicine. The indirect advantages rendered by them have, I believe, been of no less value, and this is a point I wish to emphasize in considering the progress of medicine. We cannot, at least we are not likely to, be exact on so many points without this exerting a powerful influence on our whole mental state. "Habits, if not resisted, soon become necessity." Woe be to those who use instruments of precision carelessly It were better they were left unused. The extended use of instruments of precision, then, has made us, or made us try to be, exact in all our observations.

Advances in science must begin with increased exactness of observation. The human faculties have probably but little improved since the great age of Roman and Greek pre-eminence. Knowledge has increased and become more widely diffused, and will continue to advance by the application of our trained faculties to new and increasingly exact observations. Far be it from me to imply that our observations have reached the degree of accuracy to be desired. It is often said that medicine is not a science—that it is a mere empirical art. We claim that it is a science as well as an art; a science that traces diseases to their causes, and an art which guided by this knowledge endeavours to prevent or remove them. It is a practical and not an abstract branch of science. That the science is not so exact as some others is due to the complexity of the phenomena with which we have to deal. A mistake in judging of this matter is often made through confounding accuracy with precision. Our observations are often accurate, but from the nature of the problem, are not precise, though we endeavour to make them so. The ever varying and complex phenomena with which we have to deal is not taken into account by our critics, and confusion and ignorance imputed to us which belong to the intricacy of the subject. To be definite is not necessarily to be correct, and we cannot be more definite than the facts. It is to this cause that medical men often appear to such disadvantage in law-courts. Medical witnesses are made to look foolish by counsel because they will not give unqualified answers to their casuistical questions. Differences of opinion among doctors are held to prove their ignorance. But differences of opinion are equally common amongst lawyers where the matters are comparatively simple. Judges differ in their decisions, and the ruling of one court is overruled by another, and re-affirmed by a higher tribunal. If doctors differ, do theologians agree? That medical science has not reached the point capable of "ascertaining the causes that determine every departure from the natural type, whether of form or function," is only to say that it has not reached its final development. I have shown that we try to be scientific in our methods, and welcome every aid that renders medicine more exact. The great fault of our methods at the present day, as in the time of Hunter, appears to be the national habit of amassing observations and facts rather than in seeking the explanation that underlies them. It was this mental attitude of Hunter's contemporaries that made him of little esteem to them and caused them to look upon him "as little better than an innovator and an enthusiast." There is the same hostility to generalizations at the present time. If any one, utilising the information we have acquired, thinks out the problems of disease he is apt to be regarded as a theorist, "a dreamer of dreams," a dangerous man, to be regarded with suspicion; while anyone who brings forward a novel observation, or laboriously collects a vast mass of undigested facts, is regarded as a contributor to the solid knowledge of his profession. We want all the facts, but we want still more men of John Hunter's type, capable of seeing order and law through the facts we so patiently accumulate. The qualities that go to make the really scientific doctor are two, accuracy of observation and the power of weighing evidence, the judicial faculty. Unless our observations are accurate, and to be accurate they must take cognizance of all the phenomena present, the conclusions drawn must necessarily be fallacious. The second quality is a higher and rarer one. The phenomena of disease are so many and complex that they often admit of more than one interpretation, and it is only by careful, unbiassed, and undiverted estimation of the relative and mutual significance of all the facts presented that a true conclusion can be drawn, both as to the nature of disease and the influence of treatment.

I believe, then, that the advances made in medicine have been mainly accomplished by means of increased accuracy of observation, and that this, whilst it leaves much to be desired, has permeated the whole profession. To the continued operation of this influence I believe greatly increased advances will be made in the future.

When we turn to the medicine of the future, we can foresee that we shall probably get to understand diseased processes better, and therefore, in some measure, be more able to cope with them. Too often, however, we must expect to find that, though we can more quickly, more certainly, and more distinctly recognise the signs of disease, it will be beyond our power to cure it. I think, therefore, that in the future, as in the present, the greatest achievements of our science will be in preventive medicine. Something has already been accomplished in this direction, but we cannot fail to realise how much remains to be done. How many lives are yearly sacrificed to preventable diseases! what holocusts of victims are offered to ignorance and selfish indolence! It is a matter of patriotic and justifiable pride to reflect that the three greatest achievements of medicine in saving life have emanated from our own countrymen,—

Edward Jenner, the pupil of Hunter, Spencer Wells, and Joseph Lister.

It is from bacteriological science, and the new study of animal chemistry, that the greatest triumphs of the future may be expected. We are learning that in the specific diseases it is not only the micro-organisms present that have to be considered but that it is probable that the chemical changes they set up play a most important rôle in causing the phenomena of disease. It is on this theory that Pasteur's treatment of hydrophobia is based. It is a well known fact that in connection with zymogenic organisms that the chemical product they give rise to is inimical to their own growth, and when it reaches a certain point puts a stop to the process. The same has been found to be the case in certain pathogenic organisms. So far Pasteur has been unable to discover the micro-organism which he believes is the cause of the disease. But the virus he believes not only contains the organism, but the chemical poison, and by giving the latter in small and divided doses, the patient becomes saturated with it, the micro-organism rendered incapable of growth, and the symptoms of the disease are prevented. Dr. Gamaleia is asserted to have obtained from cholera cultivations, a very active chemical substance, absolutely free from organisms, which in large doses produces deadly results in pigeons, but which, in small successive doses, is quite innocuous, and yet gives absolute protection against cholera. Similar results in connection with septicæmia have been claimed by M.M. Roux and Chamberland, and in hog-cholera by Dr. Salmon. It thus seems probable that a chemical vaccination, admitting of accurate dosage, will be discovered for many of the communicable diseases. The specific effects of quinine in malaria where a micro-organism is believed to constitute the virus, and the effects of mercury in syphilis where the virus is particulate, capable of multiplication, and, therefore, it may be safely reasoned, an organism, are instances where at present we already possess chemical antidotes. The old proverb, "every bane has its antidote," seems in the way of being verified. The search for specifics has been often, and perhaps justly, condemned. No doubt much time and energy have been wasted in the search. Those we possess have been discovered by accident, and no explanation of their action hitherto afforded. But we seem now to have struck the right path in the inquiry, in a true and scientific method. It is legitimate to hope that the development of this new science may afford us a chemical antidote to the bacillus tuberculosis, and the poisons of scarlet fever, measles, smallpox, typhoid fever, &c.

We see enough in the advances of medicine in the past and present to lead us to hope that the achievements in the future will render medicine more nearly an exact science, more capable of tracing phenomena to their causes, and of seeing beneath the many perturbations we encounter the continuous action of one ruling power. When we think of Hunter's master mind and fruitful work, we may feel tempted to doubt what is the value of our own work. But as Dr. Wilks has truly said, "it would be taking, however, but a very superficial survey of the history of science were we to look upon it as the work of the few great men whose discoveries stand out as land marks in the domain of knowledge; rather we should say, that a host of lesser workers have contributed their share in uniting these together, or even assisted in their production, for there is much truth in the saying of Göethe, that discoveries are made by the age, and not by the individual."[21] We each then have, in our several spheres, our allotted work to do. No one can deny the obligation he owes to those who have gone before us, and every right-minded man should feel it incumbent on him to acquit himself in some measure of his debt. We have not only to obtain the knowledge necessary to carry on our work but have to do something to help on our science. Many engaged in large practices, partly from pressure of work, and partly from diffidence, leave no lasting record of the knowledge they have gained; but

> "Long experience does attain
> To something like prophetic strain,"

and we ought to be able to utilise their labours. Our Society is especially useful in this, that it affords an opportunity of bringing together the facts collected by different workers, and adding them to the stock of general knowledge. A medical society is a bank where deposits can be made and interest always obtained. Here experiences may be compared, new facts communicated to others, and that which is true and valuable in our observations, winnowed from the mass of inaccuracies and worthlessness with which it is sure to be accompanied. Every one cannot be a Hunter, but everyone of us can imitate his example of untiring industry, and endeavour to make his work useful. Let us then be up and doing while the opportunity is afforded us;

> "Trust no future, howe'er pleasant!
> Let the dead Past bury its dead!
> Act—act in the living present!
> Heart within, and God o'erhead!"

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[21] Harveian Oration. 1879. p. 34.