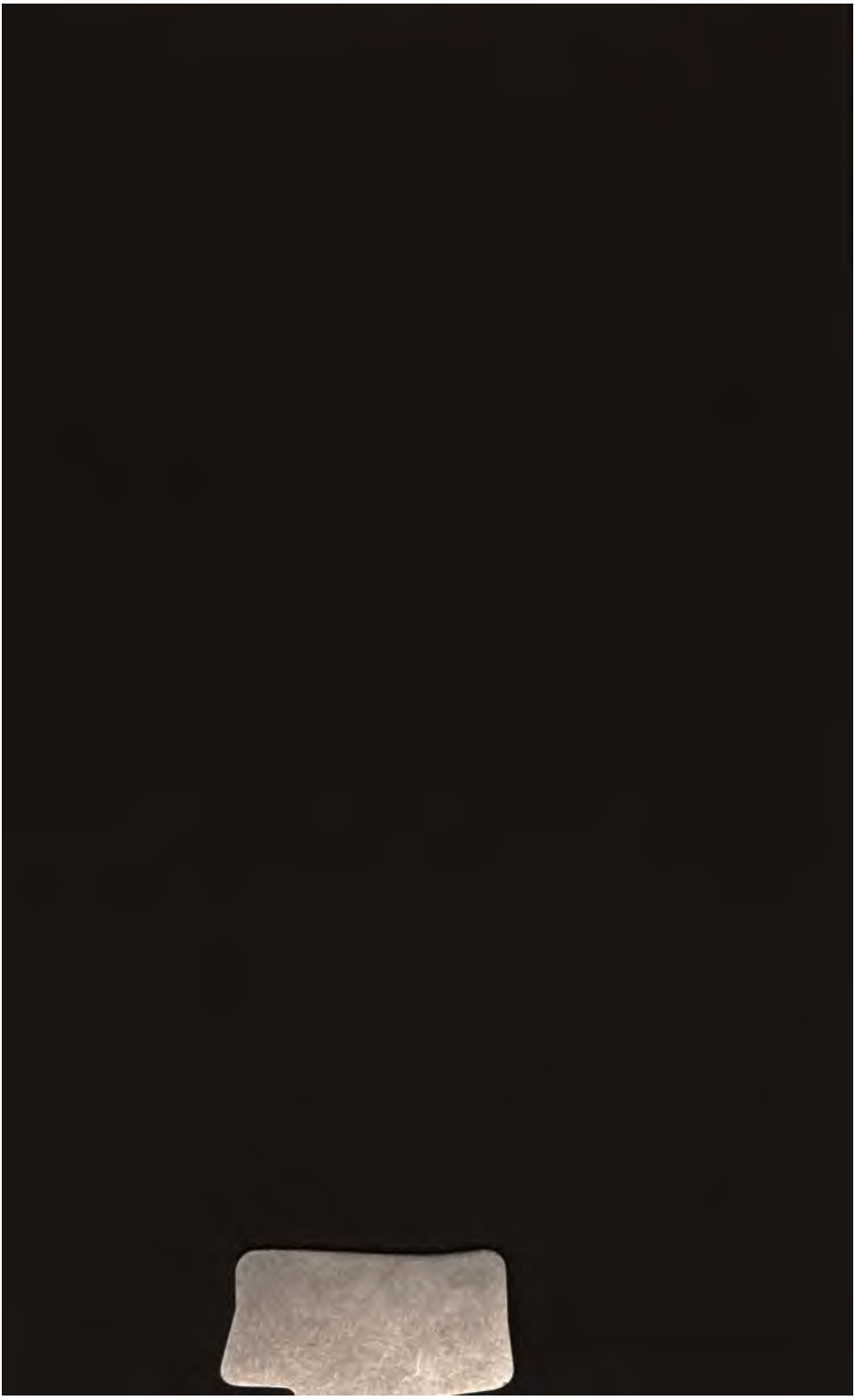
# THE HUNTERIAN ORATION 1885

JOHN MARSHALL



THE

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FEB. 14, 1885

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DELIVERED AT THE

## Royal College of Surgeons of England

14TH FEBRUARY 1885

BY

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PUBLISHED AT THE REQUEST OF THE PRESIDENT AND COUNCIL OF THE COLLEGE

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LONDON
SMITH, ELDER, & CO., 15 WATERLOO PLACE
1885

THE

# HUNTERIAN ORATION.

JOHN HUNTER—the object of our profound homage to-day—bore a name which, especially when uttered within these walls, excites the remembrance of many great achievements. Whilst therefore that name, by itself, forms a most appropriate introduction and close to an Oration to be delivered in his honour, it suggests such a superabundance of material for occupying the brief but important hour which lies before us, and so many details wherewith to embellish the sentences which must be fitted in between the Alpha and Omega of this discourse, that even the most skilled and intrepid Orator might well quail before the task.

Before, however, I attempt to grapple with the difficulties of the undertaking, I will, in obedience to time-honoured example, express, in terms I fear too brief, our common regard for the memory of those recently deceased associates, whose special relations to the College entitle them to attention on this occasion. Not that I would willingly ignore the labours of the

many Members or Fellows of the College, who, in their respective careers, now closed for ever, have maintained the character of the surgical profession. But the time at my disposal is short, and the claims upon it, as we shall find, are urgent. I must, therefore, content myself with an honourable mention of Robert Druitt, a well-known Author and earnest coadjutor in surgical educational work, and proceed to linger a little longer on three special memorial notices of Allen Thomson, Cæsar Hawkins, and Erasmus Wilson.

Professor Allen Thomson was a member of the Board of Trustees of the Hunterian Collection, to which office he was appointed in succession to his friend and former colleague in Edinburgh, William Sharpey. Familiar, from his thirty years' occupancy of the Chair of Anatomy in Glasgow, with the splendid collection, chiefly composed of William Hunter's Museum which was purchased for that University, Allen Thomson felt a special interest in our own Collection. His inherited scientific tastes, his intimate acquaintance with anatomy, human and comparative, his devotion to embryological research, and his wide knowledge of physiology, made him a true sympathiser with the work and spirit of both the brothers Hunter.

A better-known member of our Board of Trustees was the veteran London surgeon, Cæsar Henry Hawkins, a notable representative of a family whose name is indissolubly connected with the history of this College. His uncle, Mr. Charles Hawkins, an elder son of the celebrated surgeon, Sir Cæsar Hawkins, was chosen the first Master of the Court of Assistants, when the College

was incorporated under the Charter of 1800; and he was re-elected Master in 1806. The grandson of Sir Cæsar, the subject of this notice, became a member of the College in 1821, was enrolled as a Fellow in 1843, was elected into the Council in 1846, and an Examiner in 1849. Twice, after that, he occupied the Presidential chair, viz. in 1852 and 1861. From 1865 to 1870, he represented the College in the General Medical Council; and from the year 1872 to the day of his death he was, as already stated, a Trustee of the Hunterian Collection. Thirty-six years ago to-day, he delivered in this theatre an admirable Hunterian Oration; and now it has fallen to my lot to record, on the present occasion, his great usefulness as a Councillor, his strict judgment as an Examiner, and his exceptional services as twice President of the College.

Begun only five years after John Hunter's death, Cæsar Hawkins's long life of nearly eighty-six years almost bridges over the space of time which separates us from that occurrence. He was partly trained in the famous Hunterian School in Great Windmill Street, and later in life himself gave lectures there. At first a pupil and then for many years Surgeon and Consulting-Surgeon at St. George's Hospital, he was acquainted in the early part of his career with Sir Everard Home, John Hunter's brother-in-law, assistant, and literary executor; and, at a later date, with George Babington, who edited Hunter's treatise on the Venereal Disease. A most distinguished member of a distinguished surgical family, who, like himself, had been connected with Hunter's hospital and been honoured by holding Court appoint-

ments, Cæsar Hawkins was widely esteemed for his experience and diagnostic skill, his calm and excellent judgment, his high principle, even temper, and urbane manner. He was a favourite in society, and an ornament to our profession; and it is both a duty and a pleasure to express here to-day the universal opinion that he was an honour to our College.

As the name of Hawkins has been linked with the annals of the College for nearly the whole of the fast-waning century, so the future history of the College will, humanly speaking, be associated for centuries to come with that of Erasmus Wilson. That active surgeon, the incidents of whose life are generally known, received the Diploma of Member of the College in 1831, was made a Fellow in 1843, took his seat on the Council in 1870, and was chosen President in 1881. The story of his early humble means and moderate prospects, of his marked intelligence, industry, perseverance and success, culminating in the acquisition of such vast wealth, and in the exercise of such unparalleled generosity, will, assuredly, attract much notice from posterity, and will probably strike future generations with greater astonishment than it does ourselves. We, his contemporaries, can scarcely realise the importance of his unexampled bounty to our College. Its influence for good lies concealed in the future; and the responsibility of administering so grand and absolutely unshackled a bequest will be felt to be by no means slight. That its transfer to our charge may be long delayed, is a wish we may all express, together with the hope that Lady Wilson may long be spared,

to feel pride and solace in the contemplation of her husband's munificence.

It would be selfish, and unjust to the memory of this large-hearted man, to restrict our regard on this occasion to his splendid donation to the College; for Margate, Epsom, Swanscombe, and distant Aberdeen will continue in remote times to bear witness to his generous thought; many charitable societies, and countless destitute persons have felt the touch of his benevolent hand; and the whole nation owes to his liberality the actual possession of the great monolith now standing erect on the banks of the Thames. But to revert to what may truly be designated his colossal gift to the College which he loved so well: it may be an idle fancy, but I am fain to imagine that Sir Erasmus Wilson's mind was, consciously or unconsciously, influenced by his familiarity with Egyptian studies, and that he resolved, not indeed to rear an almost imperishable monument for the preservation of his body, but to secure by what we trust may be an equally enduring design for the benefit of his profession and mankind, the perpetuation of his name and fame.

But what concerning the name and fame of John Hunter! for to that theme it is my business now to turn. Happily, under no conceivable conditions of feebleness or failure in these biennial Orations can Hunter's brilliant reputation suffer damage or eclipse; but this does not lighten the responsibilities of the Orator, who finds himself embarrassed with a multiplicity of subjects, perplexed by the difficulties incidental to selection, arrangement, and comment, and

oppressed by the sense of competition with the eloquent and learned addresses which, dealing with the same topics, have preceded his own.

It might seem easy to pursue the well-trodden course of beginning with a sketch of Hunter's career from his cradle to his grave. But, for my part, I have often imagined that there might sometimes be an advantage in reversing the usual order of biographical research and narrative, and, instead of pursuing the downward and smoother course, to follow an upward and more rugged path. As in tracing the history of mankind, or the origin of things, the historian or the philosopher employs this retrograde method of investigation, so, at least in an inquiry into the history of a single individual, we might pass from the later and better-known periods to the earlier less known or even unknown moments of his existence. And again, although, as in the case of a river, so in that of a life, it may be more easy, when it has been fully explored, to glide down its unceasing current, yet, in the upward struggle against the stream, with its halts and delays, we have larger opportunities of becoming familiar with its peculiarities, its shoals and rocks, its rapids and cataracts, its swift strong currents, its gentle windings, its resting-places, and its sluggish pools.

John Hunter's story may, I think, be said to lend itself readily to this mode of treatment, permitting itself to be broken up into successive and variable stages, one very exceptional incident being noticeable even after his death. Thus, just sixty-six years after his lamented decease in the 66th year of his age, we find his

ashes laid, with fitting reverence, in their final resting-place beneath the stones of Westminster's venerable Abbey,[1] in a pilgrimage to which we may read inscribed on perennial brass his distinguishing title, 'The Founder of Scientific Surgery.' Thence we pass back to the unostentatious obsequies held at his parochial church, St. Martin's-in-the-Fields, and then again, by way of his house in Leicester Square, to that sad and tragic scene at St. George's Hospital, where, upwards of ninety years ago, to the dismay of both friends and opponents, he so suddenly expired.[2]

Transferring our views from the inanimate body to the living man, crossing, as it were, the bar between the ocean and the river, we find the last five years of John Hunter's life to be the busiest of all. After the death of Pott[3] he became the leading Surgeon in London, and was responsible, as he reminds us, for exacting official work as Surgeon-General Inspector in the Army. Physically and mentally overstrained, broken in health, ceasing either to lecture or to prepare papers for the Royal Society as previously was his wont, and anxious, with the assistance of Mr. Home, his brother-in-law, to perfect the Catalogues of his vast collection, on which he had expended 70,000*l.*, and which, after thirty-five years of labour and care, was now practically complete, and constituted his only realised wealth—Hunter still found time to finish his admirable 'Observations on Bees,' the result of twenty years of close study, and to begin to arrange his great work on 'Inflammation and Gunshot Wounds,' which he described as the

[1] March 28, 1859. [2] Oct. 16, 1793. [3] 1788.

outcome of forty years of investigation and reflection, but the publication of which he did not live to see.

Passing backwards from this brief and tumultuous epoch of his career, we enter upon a decennial period[4] laden with great practical issues. During this time, he contributed ten Papers and six Croonian lectures to the Royal Society, and was awarded the Copley medal; he assisted in founding and supporting a special Medical and Chirurgical Society; he published the 'Animal Economy,' containing his essays on Animal Heat and other subjects, his work on 'The Venereal Disease,' and the second part of his 'Treatise on the Teeth.' It was now that he planned and performed his celebrated operation for Aneurism,[5] and, in his hospital and private relations, attained his full height as a scientific and practical surgeon. Finding that the best apartments of his house in Jermyn Street would no longer accommodate his growing collection, he moved to Leicester Square,[6] where he built, at the cost of 3,000*l.*, a new Museum and working-rooms, and subsequently exhibited his collection to medical and scientific men, often expounding its contents with evident delight. Amidst all these active pursuits, he enjoyed the calmer pleasures derived from the study of animals and plants, in his country retreat at Earl's Court—a recreation the more welcome as he now experienced not infrequent derangements of his health.

In the preceding decennium,[7] Hunter delivered two Croonian lectures, and sent six Papers to the Royal

[4] 1778–87. [5] Dec. 1785. [6] 1783. [7] 1768–77.

Society; besides these, he was much occupied with his researches on Animal Heat, and on the effects of Cold on animals and plants, whilst he also kept up a constant correspondence with Jenner on subjects of interest to them both. Being now full Surgeon at his hospital,[8] and regarded as an authority by his professional brethren, he availed himself of the opportunities thus presented to him, and extended his observations from healthy anatomy, human and comparative, to morbid anatomy. Overwhelmed with specimens in each of these departments, he engaged the services of his able assistant, Bell, for ten years, with the result of employing him for fourteen years. It was in this period also,[9] that Hunter became a Member of the Corporation or Company of Surgeons, from which this College is descended.

The characteristic features of the next antecedent ten years of Hunter's life[10] were the extension of the sphere of his anatomical researches from man to animals, and the awakening of his mind to the many enigmas of living action in the organs and parts which he dissected. Henceforth handiwork and brainwork went together; and experimental researches, such, for example, as those on 'Absorption by Veins,' occupied his attention, as well as the structure of 'the Ear in Fishes.' In this period too, occurred that important divergent bend in the current of his life,[11] his temporary service abroad as Surgeon in the army at the siege of Belle-Isle, and afterwards in Portugal; for then it was that he first seriously began those speculations on the dark problems of the inflam-

[8] 1768. [9] 1768. [10] 1758-67. [11] 1761-3.

matory process, which he gradually matured, and afterwards continued to teach. But, in spite of this, the pure-science fever was upon him, and the mania for anatomical research held him fast; for on his return, we find him considered worthy of election into the Royal Society,[12] even though he had not presented it with a Paper; and, now separated from his brother William, he commenced to form a Museum of his own.

In the preceding decennial period,[13] having crossed the border between Scotland and England, John Hunter, at about the age of twenty, arrived in London,[14] as yet without a glimmering of anatomical, physiological, pathological, or surgical knowledge. Trained during this period under his brother's guidance, his attention was exclusively devoted to human anatomy, in which science he became highly accomplished, and to which he made some important contributions. During the summer months, and when not engaged in the dissecting-room and the museum, he devoted his time and thought to medicine and surgery, and finally resolved to pursue the latter. Thus early in life, he began, what was quite an innovation, to interweave pure scientific work with practice, and so foreshadowed his future great destiny.

And now we enter upon a longer epoch of twice ten years,[15] throughout which the narrow stream of John Hunter's life becomes most difficult to trace, but in which, at least, it is evident that he made little mark either as regards intellectual or manual work. His father's death, when he himself was ten years old, divides this period into two. In the latter part of it,

[12] 1767. [13] 1748–57. [14] 1747 or 1748. [15] 1728-47.

controlled only by his mother, the future Anatomist and Surgeon is said to have been an idler; but he appears once on the surface, as resident with his brother-in-law, who was a cabinet-maker in Glasgow, where he may perhaps have acquired some useful command over his hands. The record of the first ten years of his boyhood is a blank, and so we follow him in silence to his humble cot at Calderwood, the place in which he was born.[16]

In regarding the lives of all great men, we naturally marvel at the extraordinary results which flow from such small beginnings, especially when, standing at their graves, we reflect that as living and working entities they exist no more. There also, it is, that science sees nothing but the lifeless remains, and, divorced from faith, has no further word to utter. But, on the other hand, when science turns her gaze beyond the cradle into the remote past, she perceives an endless chain of living organisms, and, now independent of faith, wonders by what mysterious ordinance—call it creation, call it evolution, call it what men will—an apparently casual protoplastic unit shall grow up to be a man, who, by force of his innate power, and under certain surroundings, shall come to exhibit such pre-eminence amongst his fellow-men, and leave so deep an impress on the world.

The physical and mental qualities which enabled Hunter to accomplish more than any member of our profession has done before or since, were not attributes or possessions peculiar to him alone, but his success was achieved by the mode in which he used them. Some

[16] Feb. 13 or 14, 1728.

men take opportunities, and others make them: it may be said of Hunter that he did both.

I do not here propose to analyse the intellectual and moral character of Hunter, or to pass in review his professional, social, and domestic relations. I need not further particularise his work; for this stands revealed in the Museum, or is recorded in the Museum Catalogues, and in his own Writings.[17] Neither will I attempt to vindicate his claims as a discoverer, seeing that the task is most difficult in his case, and that very frequently such discussions still remain open to be rediscussed; nor, lastly, shall I endeavour to assert that, in this or that instance, he has anticipated any later views or doctrines, for such suggested anticipations have often to yield precedence to those of some earlier heralds of coming thought.

If it be not too presumptuous a method to adopt, I will rather imagine Hunter to be with us in presence this day; and, judging him by his own deeds and declarations, I will try to point out the mental attitude he would probably assume, in regard to the active work and salient opinions of our own times.

Let me first, with this view, direct attention to the *Hunterian Collection*, for it cannot be doubted that Hunter himself would first wend his way to discover what had become of it. We may trust that he would be satisfied that this College should have become the depository of his fine Museum, and would feel gratified at the efforts which have been made for its due preservation and extension. He would appreciate the zeal of

[17] See Appendix A.

its successive Conservators and their able coadjutors, in perfecting its special departments, osteological, craniological, and otological, in opening out fresh fields of observation, and in seeking new forms of illustration. He would realise the value of the palæontological specimens added since his day, and the advantage or necessity of arranging side by side extinct with recent animal forms. He would admire the skill displayed in the new articulated and dissected preparations. He would recognise with special thankfulness the labours of our late excellent Conservator Professor Flower and his assistants, in the preparation of efficient Catalogues of the Museum. Nor, finally, can we doubt that Hunter would hail with pleasure the prospect that no inconsiderable portion of the Erasmus Wilson bequest will be devoted to increasing the accommodation for the unique collection, of which his own Museum was the foundation. I ask pardon for the simplicity of these assumptions, but we must not forget Hunter's affection for his Museum. Remembering this, too, I will add, parenthetically, that the increased number of such Collections, and their steady improvement in recent times, would not fail to secure the approval of so great a Museum-maker.

Speaking of himself, Hunter says,' I do not read many books '; [18] perhaps, therefore, we might suppose that he would be comparatively apathetic as regards the extension of our *Library*; but, nevertheless, abundant

[18] Vol. i. p. 412.—*The Works of John Hunter, F.R.S.*, with notes, edited by James F. Palmer, in four volumes, 1835–37; to which all the future references are made, unless otherwise specified.

evidence exists to show that he would not be wholly indifferent to the interests of that Department of the College.[19]

If we next regard John Hunter as an accomplished *Human Anatomist*, it needs only briefly to be said, that he could have no difficulty in keeping pace with whatever advances have been made, since his time, in the knowledge of the ordinary structure of the human body, as well as of the numerous varieties in arteries, muscles, and other parts, to which it has been shown to be liable.

The immense progress which has been made in the science of *Comparative Anatomy* since Hunter's days, could not fail to excite the liveliest satisfaction even in *his* well-stored mind. Countless as are the facts which have been brought to light by the combined efforts of succeeding comparative anatomists, from the time of Cuvier down to the present moment, they would all be welcome to him. To one who had spent thirty years in this field of study, and had himself dissected and described about 500 species of animals, vertebrate and invertebrate,[20] the diversified new forms and structures which would be presented to his notice, could not of course be accepted by him otherwise than as facts. Parts possessing functional significance would be promptly assigned by him to their respective places in his great physiological series. Special structures would be studied by him with even deeper interest; whilst he would quickly learn to appreciate the many novel and

[19] See *Hunterian Oration*, by Mr. F. Skey, F.R.S., 1850, p. 5.
[20] Vol. iv. p. 7.

unexpected forms which would lie outside his experience, and even beyond his conception.

So, likewise, the wonderful, and, to Hunter, unforeseen revelations of *Microscopical* research, the growth of that new department of anatomy, *Histology*, the insight we have obtained into the origin and development of the tissues and organs of animals and plants, and the extensive acquaintance which has been made with the existence and characters of innumerable minute independent organisms, both in the animal and vegetable kingdoms, would fill Hunter's mind with amazement and delight. It is true, that, although he employed magnifying-glasses in some of his own investigations, he doubted, and even discredited, the results recorded by other observers.[21] Nor is this surprising, for whilst the microscope had even then realised some important discoveries, there were many announcements made which were either perplexing or absurd—the effects of irradiation, diffraction and dispersion, being sometimes seriously regarded as indications of minute structure. Besides this, Hunter had so large a field of observation in the obvious conformation of the organs of animals open to his reach by the aid of scalpel, scissors, and forceps, assisted occasionally by magnifying powers, that he could well afford to disregard the less trustworthy information afforded by the imperfect microscopes of his day. We may be sure, however, that he could not, and, indeed, would not, resist the evidences of structure and organisation displayed by our powerful and exact modern instruments; and we

[21] Vol. iii. p. 60, note.

can easily imagine his acquiescence in the truth of a modified Cell-theory of the formation of tissues, and in the doctrine of the Protoplasmic origin of animal and vegetable life.

Hunter would also find much in modern microscopic discovery which would correct, elucidate, or confirm his own guesses at truth. Concerning the globules of the blood, he says, that 'magnifying-glasses appear to give a good deal of information';[22] but the different descriptions then given of these globules in man and animals confused and disheartened him, and he would be glad to have more precise information concerning these formed constituents of the blood. Nevertheless, he was able to conclude, from the facts that these bodies were colourless or, as he believed, absent, in insects, and that the red globules appeared late in the blood of the embryo chick, that these coloured elements were not so essential to nutrition as the colourless parts of that fluid.[23] How eagerly would Hunter have availed himself of our present knowledge of the formation and growth of bone (which he so closely studied), of the differences in that process in bones formed from cartilage and those formed from membrane (amongst which latter he correctly placed the broad bones of the skull), and, lastly, of the exact details of that 'modelling' process which he pointed out must take place in growing bones, and on which he dwells so strongly, as affording proof of the action of the absorbents![24] Again, his views of the structure and formation of the tooth enamel, the fibres of which he describes as crystalline and as the

[22] Vol. iii. p. 59. [23] Vol. iii. pp. 58, 66, 68. [24] Vol. i. pp. 252, 253.

result of a process of crystallisation on the dentine, and yet in which he recognised the existence of an 'animal mucilaginous matter,'[25] would now become more defined; and the then unexplained sensitiveness of the dentine would be accounted for by the demonstration of the prolongations of nerve elements into its tubuli.[26] So, too, the exquisite structure of the voluntary muscular fibre, and the changes it undergoes during its contraction and relaxation, as revealed to us by the investigations of still living observers—its serial discs with their rods and swellings—would have gladdened Hunter's sight, as so strictly coinciding with his prescient conjectures on this difficult subject. 'I do suppose,' he says, 'that a muscular fibre is not one uniform body from end to end, but is made up of parts, which may be called the component parts of a muscular fibre; and I am apt to suppose that a change takes place in the position of those parts during contraction, and this alteration diminishes the extent of those parts in one direction while it is increasing them in the other, . . . but what that alteration is I shall not pretend to determine.'[27] Elsewhere he states: 'Muscular motion . . . is a uniform approximation and receding in all the parts; the size, construction, and connection of these are as yet not known';[28] and again, 'what the difference is in a muscular fibre between its relaxed state and the contracted, perhaps may never be known';[29] and, lastly, he regards the firmness of a contracted muscle as possibly being due to 'a particular position of the

[25] Vol. ii. pp. 15, 41. [26] Vol. ii. p. 50. [27] Vol. iv. p. 261.
[28] Vol. iv. p. 255. [29] Vol. iv. p. 264.

constituent parts of a muscular fibre, so as to become immovable while in that position.'[30] Concerning the structure of the coats of the arteries, on the contractility of which Hunter made so many experiments, he states, that he knew them to be muscular only by experiment;[31] and, on similar grounds, he states that these vessels become more muscular and less dependent on elasticity the further they are removed from the heart.[32] *Now*, he could be actually shown the involuntary muscular fibres of the arteries and their relative abundance in the smaller vessels. Again, Hunter supposed that the mucous membranes had no cuticle;[33] but how instantly would he accept the demonstration of the epithelial covering of those membranes, and indeed would proceed to generalise on the fact! Looking, for example, to the uniform presence of glandular epithelium in all digestive cavities, he would justify his grand conclusion—which he announces with a sarcastic thrust at the various mechanical theories of digestion by trituration and simple solution—that the digestive process must be uniform throughout the animal kingdom, and be accomplished by the action of a similar secretion or juice,[34] which he believed was always acid, as he almost invariably found it to be so.[35] It may also be mentioned here, that Hunter imagined the absorbents to have mouths or openings communicating with the interspaces in the common areolar tissue;[36] and, in describing the inflammatory process, he constantly com-

[30] Vol. iv. p. 256.
[31] Vol. iii. pp. 157, 158, 160.
[32] Vol. iii. pp. 160, 169; vol. iv. p. 253.
[33] Vol. ii. pp. 145, 316.
[34] Vol. i. p. 97; vol. iv. pp. 82, 87, 94, 121.
[35] Vol. iv. p. 121, note.
[36] Vol. i. p. 257.

pared these interspaces with the circumscribed serous cavities.[37] *Now*, he would find the former idea verified by microscopic research, and the latter comparison strengthened by the discovery of lymphatic pores on the free surface of the costal pleura. Lastly, Hunter's beautiful observations on the development of the chick would have prepared him to follow with infinite pleasure the delicate demonstrations of modern embryologists. In a word, not only in this respect, but in the entire round of microscopic work, Hunter would be charmed with the triumphs of modern inventiveness and skill.

As a *Physiologist*, Hunter was so zealous, unwearied and accurate an experimentalist, that we may be assured of his sympathy with the present refined and stringent methods of research. He cogitated new experiments whilst in his carriage;[38] he had recourse to them in almost every inquiry; he spared no expense in their execution;[39] he planned them so carefully, and limited them so in their intention, as to avoid failure or fallacy;[40] he modified them, so as to adapt them to new occasions; and he endeavoured to learn something from them, even when they yielded unanticipated results.[41] He proposed himself to perform many experiments which he did not live to undertake; he suggested to others certain inquiries which he thought worthy of being carried out; and, lastly, he declared that no experimental results could be depended upon which had not

[37] Vol. i. pp. 394, 395; vol. iii. pp. 255, 293, 349.
[38] Vol. iv. p. 424.
[39] Vol. iv. p. 54, note.
[40] Vol. iv. p. 115.
[41] Vol. iv. p. 424.

been obtained by duly qualified observers.[42] In all these respects, he would be in accord with the best investigators of our time. We may read with a smile his simple experiments on the effects of a decoction of bark, opium, or calumba on the coagulation of the blood;[43] and be amused at the pleasure he expresses at receiving Ramsden's small thermometer, 'measuring only one-sixth of an inch wide in the stem,' for the prosecution of his experiments on animal heat;[44] but we may be sure that he would be struck with admiration at the complex mechanical and electrical appliances, and at the variety of chemical agents, employed in the well-furnished laboratories of modern physiologists. That he would approve the sphygmograph, cardiograph, and myograph, the clockwork cylinders, and the clever resources of the graphic method, may be regarded as certain. An ingenious experiment which Hunter devised but never carried out, and which would have led to a negative result, shows us how he would appreciate Helmholtz's demonstration of the changes in the curvature of the crystalline lens, by observing the accompanying alterations in the luminous image of a candle-flame, as seen in the living eye. Being convinced that the adaptation of the eye to see at different distances could only be explained by the occurrence of a change in the form of the crystalline lens (which he had shown to be fibrous, and which he believed to be muscular), Hunter proposed to test this by taking the lens from the eye of a bullock just slaughtered, placing it in water so that it might produce an image of a 'lucid object,'

[42] Vol. iv. p. 83. [43] Vol. iii. pp. 135, 136. [44] Vol. i. p. 136.

and then watching for any change in that image on the addition of warm water as a stimulus.[45]

It is needless to observe, to those who are familiar with Hunter's writings, that not only as a physiologist, but as a pathologist, he was a great *vivisector*; and we may here take it for granted that he would rank himself with those who now claim the right of man, for beneficial purposes, or even in the pursuit of knowledge, to attempt to discover the processes of animal life by tests and trials on living animals. Hunter's own numerous experiments certainly threw light on many of these processes. Amongst others may particularly be mentioned those on absorption by the veins, on animal heat, on the effects of heat and cold on animals, on the injection of various solutions into the veins, on artificial respiration with the view of recovering drowned persons, on the ligature of arteries, on the growth of bones, on the division of tendons, on the effects of extirpation of the ovary, and on the transplantation of living parts into other living parts.[46] All Hunter's experiments were necessarily performed without anæsthetics; but we may be sure that he would now approve of their use on every possible occasion. His large views of the unity of the 'Principle of Life' and of the community of organisation and of action throughout the whole animal kingdom,[47] would lead him to disregard the objections of those who insist on the uselessness of experiments on animals, so far as concerns their application to man. On the contrary, I can conceive that Hunter would contend that every fact ascertained concerning the processes

[45] Vol. iv. p. 287. [46] Vol. iv. *loc. var.* [47] Vol. i. p. 226.

of life, whatever the quarter from which it was derived, whether from organisms high or low in the scale, or from animals in health or in disease, must contribute its quota towards the attainment of more perfect knowledge; and that it is to the sum of these efforts at discovery, and not to individual results, that we must look for a scientific justification of this method of inquiry. Hunter distinctly denounces a physiologist who, 'like all mere experimenters,' 'is not satisfied with those [experiments] which are clear and decisive, but multiplies them unnecessarily'; and he adds, 'I think we may set it down as an axiom that experiments should not be often repeated which tend merely to establish a principle already known and admitted, but that the next step should be the application of that principle to useful purposes.'[48] It may accordingly be inferred that, whilst Hunter would contend for the fullest right of research, he would not be opposed, either on scientific grounds, or (as he was fond of animals, and certainly not desirous of encouraging cruel propensities amongst men) on moral grounds also, to due restrictions in the exercise of this right. Lastly, in reference to this subject, it should be stated that Hunter did not spare his own body, but subjected himself to an inoculation experiment of a very grave character, in order to test opinions on a pathological question, and to put to proof the efficacy of certain variations in treatment. As a consequence of this, he was not completely cured until the expiration of three years. Indeed, it is not impossible that he incurred still later injurious sequels.

[48] Vol. iv. p. 86.

In referring to Hunter's physiological experiments, it is certainly remarkable to find that he never performed any with the view of determining the functions of the nerves, and of the nerve-centres. Yet it is in this branch of inquiry that, since his time, physiology has made such great strides, almost exclusively by means of experiments. Nevertheless, Hunter was not unmindful of the momentous questions herein involved. Thus, he clearly distinguished the functions of common and special sensory nerves, as dependent on their origin and connections;[49] and he remarks, 'it is more than probable that every sensory nerve, in whatever part an impression is made upon it, always gives the same sensation as if affected at the common seat of sensation of that particular nerve.'[50] In his interesting discussions on sympathies, he says, 'one part under stimulus or irritation is capable of stimulating another part of the same body into sensation, and action, &c., which, I think, is the most natural idea or position.'[51] He explains, by aid of a diagram, many sympathies by probable communications existing between different nerves;[52] but he adds, 'it is possible that sympathy is not effected by the nerves communicating with one another in the body, but from their connections in the brain.'[53] He just saw in what way an 'original cause' or a 'double sympathy' might explain the symmetry of disease.[54] He speaks of organic actions and movements occurring in the body which have nothing to do with the sensitive

[49] Vol. iv. p. 190. [50] Vol. iv. p. 191. [51] Vol. i. p. 320.
[52] Vol. i. p. 332. [53] Vol. i. p. 333.
[54] Vol. i. p. 321; vol. ii. p. 61.

principle,'[55] and elsewhere he says, 'so that those involuntary actions of the voluntary muscles arise from a stimulus independent of the will.'[56] Lastly, he explains the movements of the polypus in search of food by supposing that 'the stomach first sympathises with the whole body when it wants repletion, and afterwards by a reflex sympathy the body is called into action and its little arms are erected.'[57]

Notwithstanding the significance of these quotations, I will, in accordance with my settled plan, refrain from a suggestion of discovery or anticipation; but I would ask, would not Hunter be prepared, would he not be delighted to listen to the explanations which, thanks to Bell, Marshall Hall, Brown-Séquard, and their numerous followers, could now be given him of the mechanism of the various forms of cerebral and spinal, sensory and motor reflex phenomena?

Finally, as regards the higher manifestations of action of the great nervous centres, Hunter makes the following pregnant statements: 'Sensation' (by which he evidently understood conscious sensation) 'is only the intelligence of action';[58] 'a disposition of the mind . . . entirely arises from some action of the brain, or a certain position of the parts of the brain takes place, giving them an inclination to produce action';[59] and, after stating that in sensation the brain only receives impressions, but 'in mind it is active,' he adds, 'Mind arises from a peculiar quality in the sensation, being expressive of some quality in the body which is

[55] Vol. i. p. 268. [56] Vol. iv. p. 268. [57] Vol. i. p. 328.
[58] Vol. i. p. 319. [59] Vol. i. p. 370.

the object of sensation, and which gives an action to the brain answering to those qualities, as agreeable or disagreeable, with all their different species, as love, joy, hate, anger, &c., which actions of the brain or states of the mind' (using, be it observed, these terms as physical and mental equivalents) 'become the cause of further modes of action in the body affecting both involuntary and voluntary muscles.' He also remarks that 'reason, by influencing the will, becomes the cause of the voluntary actions; and by this connection all these principles can affect one another.'[60] Herein, therefore, we see how Hunter could grasp the substance of modern physio-psychology; how he would accept the classification of the mental processes into sensation, emotion, intellect, and will; how he could separate instincts, the offspring of emotions, from rational acts, and so come to speak, as he does, of the 'mind of a bee'; and how, lastly, he could follow the modern attempts to unravel those impulses in our nature which, springing from combinations and reactions of different simple mental factors, are supposed to explain the mysterious evolution of the highest faculties of our minds.

But I must next proceed to consider the position that we might suppose Hunter to occupy in regard to the zoological, morphological, and biological questions and doctrines of the present day.

Although Hunter's comparative anatomy collection was avowedly made in the laborious search after the relations between structure and function, and was

[60] Vol. i. p. 259.

arranged by him accordingly in a grand physiological series, yet he was a practical *Zoologist*, for he had not only formed a large separate zoological series of specimens, but, studying carefully each sub-division of his Collection, he observed not only the uses, but the gradations of form, which the various organs assume in the different groups of animals with which he was acquainted. Seeing how readily Hunter employed his knowledge of the comparative anatomy of the digestive, circulatory, respiratory, and reproductive organs, and also that of the nervous system, in his attempts at the scientific classification of animals,[61] we may easily conceive that he would have accepted the more advanced Cuvierian arrangement founded on wider knowledge than his own, and how truly he would appreciate the various modifications of that system found necessary by succeeding zoologists.

Regarded as a *Morphologist*, we find that Hunter, very early in his career, repudiated 'the idea'[62] of confining himself to the description of a single animal; and, as he accumulated his great wealth of facts, he handled them from a morphological point of view with the boldness and ease characteristic of a master. Thus, he not only speaks freely of the 'hearts' of insects, the 'lungs' of the snail, and of the 'brains' of both, and compares the 'median nerve-chords' of the former to the 'medulla spinalis' of the vertebrate animals,[63] but he writes of there being 'ten thousand animals without a brain and nervous system to one with them;[64] and he

[61] Vol. iv. pp. xvi.–xxxvi.
[62] Vol. iv. p. vi.
[63] *Loc. var. op. cit.*
[64] Vol. i. p. 248.

furthermore indicates the possibility of a nervous substance being diffused throughout the body of the very lowest animals, without any visible aggregated centre.[65] He traces the digestive apparatus from the most complex stomach downwards in the animal kingdom to a simple sac,[66] and in describing the comparative anatomy of the fish's ear, he says, 'he is inclined to consider whatever is uncommon in the structure of this organ in fishes as only a link in the chain of varieties displayed in its formation in different animals, descending from the most perfect to the most imperfect, in a regular progression.'[67] Again, in his estimate of the character of the strong muscular stomach of the Gillaroo trout, he says, it is as 'difficult to determine the exact limits of the two different modes of construction to which the names of gizzard and stomach specifically belong, as in any other case to distinguish proximate steps in the slow and imperceptible gradations of Nature.'[68] From all this, it is very evident that Hunter could not fail to perceive the bearing of the multitude of facts pointing to similar conclusions, which have been recorded since his time.

But, further still, there is the oft-quoted passage, written in reference to his developmental researches on the embryo of the chick, in which he says, 'if we were capable of following the progress of increase of the number of the parts of the most perfect animal, as they are first formed in succession, from the very first, to its state of full perfection, we should probably be able to

[65] Vol. iv. p. xxviii.; vol. iii. pp. 116, 117.
[66] Vol. i. pp. 162, 247.
[67] Vol. iv. p. 203.
[68] Vol. iv. p. 127.

compare it with some one of the incomplete animals themselves, of every order in the creation, being at no stage different from some of those inferior orders; or, in other words, if we were to take a series of animals from the most imperfect to the perfect, we should probably find an imperfect animal corresponding with some stage of the most perfect.'[69] Here he has expressed, in laboured phraseology, a current doctrine of development; but Hunter elsewhere applies a similar train of reflection to muscular tissues; for he says, 'in many of the more simple animals there is little else besides those formations or organisations composed of muscles,'[70] and he quotes a polypus as an example; whilst in subsequent passages, he points out that there is a 'difference of density of muscular fibres in a pretty regular gradation from the most imperfect to the most perfect, from the muscles of the medusa to those of the full-grown quadruped.'[71] He further remarks, 'that the first rudiments of every animal are extremely soft, and even the rudiments of the more perfect are similar to the full-grown imperfect, and as they advance in growth they become firmer and firmer.'[72] And in connection with these morphological questions, I may also point out his observation, that in the earliest embryonic condition 'the heart is a pretty firm manageable part, while every other muscular part of the animal is as tender as jelly.'[73]

I now pass naturally to the consideration of the

[69] Vol. i. p. 265; also in *Physiological Catalogue*, vol. ii. p. iv.
[70] Vol. iv. p. 244.
[71] Vol. iv. p. 268.
[72] Vol. iv. pp. 268, 269.
[73] Vol. iv. p. 271.

view which Hunter would, I believe, entertain, as a *Biologist*, concerning the prevalent doctrines of *Evolution*; and I will commence by citing what I think will be admitted to be some noteworthy passages from his writings.

On the general question of the occurrence of varieties in animals, Hunter, in one place, states as a general fact, that 'Nature is found deviating from general principles.'[74] In another place (in reference, however, to sexual adaptations), he observes, that 'an animal has the power of improving its parts, so as to make them susceptible of such stimuli as are adapted to the disposition of the parts.'[75] Again he states, that 'as far as my knowledge has extended, there is not a single part of an animal body which is not subject to an extraordinary formation. Neither,' he proceeds, 'is this a matter of mere chance; for it may be observed that every species has a disposition to deviate from Nature in a manner peculiar to itself.'[76] It is true that these latter remarks are applied by Hunter especially to deviations which he says are 'more or less monstrous'; but he afterwards, as we shall see, qualifies that term, and the whole context shows Hunter's genuine appreciation of the natural plasticity of animal organisms. More to the present purpose, however, is the following passage: 'The propagation or continuance of animals in their distinct classes is an established law of Nature, and in a general way is present with a tolerable degree of uniformity; but in the individuals of each species, varieties are every day produced in colour, shape, size,

[74] Vol. iv. p. 319. [75] Vol. i. p. 269. [76] Vol. iv. pp. 44, 45.

and disposition. Some of these changes are permanent with respect to the propagation of the animal, becoming so far a part of its nature as to be continued to the offspring.'[77]

Contrasting again, in another paragraph, the phenomena of variation as they occur in wild and in domesticated animals, to which he obviously paid close attention, Hunter says, 'Animals living in a free and natural state are subject to few deviations from their specific character; but Nature is less uniform in its operations when influenced by culture. Considerable variations are produced under such circumstances, of which the most frequent are changes in colour.' In a note, he adds, 'From the variations produced by culture it would appear that the animal is so susceptible of impression as to vary Nature's actions; and this is even carried into propagation.'[78] Still more striking is a note in which, speaking of extreme variations as monstrous, he reflects, 'Perhaps the word monstrous is too strong or not exactly just'; and then, he adds this remarkable passage, 'It certainly may be laid down as one of the principles or laws of Nature to deviate under certain circumstances. It may also be observed that it is neither necessary, nor does it follow that all deviations from the original must be a falling off; it appears just the contrary; therefore we may suppose that Nature is improving her works, or at least has established the principle of improvement in the body as well as in the mind.'[79] Given the additional factor of the advantages bestowed upon individuals by such

[77] Vol. iv. p. 277. [78] *Ibid.* [79] Vol. iv. pp. 278, 279, note.

improvements in the 'struggle for existence,' and Hunter would have discerned the Darwinian doctrines of 'modification in descent,' and 'the survival of the fittest.'

Nor did the question of Reversion to the original type, which Darwin so freely discusses, fail to attract Hunter's notice; for in regard to varieties arising from cultivation, he says, 'Whether, if left to themselves, they would in time resume their original appearance, I do not know,'[80] and elsewhere he remarks, 'I am inclined to think there never is in the wild state a variety in any species of animal in the same country.'[81] Furthermore, he makes the important reflection in regard to reversions, that 'it would be difficult to prove whether in many of the gradations they are progressive or retrograde.'[82] Lastly, he alludes to the necessary adaptation of some insects to uniform, and of others to variable climates; and he reflects on the differences of habit which must thus be brought about.[83]

It will be recollected, that Darwin employs the term Correlation, as descriptive of certain constant and associated peculiarities and changes in an animal, which may or may not be capable of further explanation; and it is interesting to find that Hunter without using that general term, which after all is only a term, points out as a 'general principle' a constant correspondence between the colour of the pigmentum of the eye and the colour of the eyelashes, not only in quadrupeds but in birds, even when the colour of the skin, hair, or feathers is different.[84] The

[80] Vol. iv. p. 278. [81] Vol. iv. p. 319. [82] Vol. iv. p. 330.
[83] Vol. iv. p. 425. [84] Vol. iv. p. 280.

occurrence of such correlated sexual characters in animals was recognised by Hunter; and his paper on the peculiarities of a hen pheasant which had acquired the plumage of a male, is full of reflections and suggestions conceived in the true Darwinian spirit.[85]

The preceding quotations show, at least, that had Hunter lived now, he would have been a staunch *Evolutionist.* We may picture him devouring with eagerness the writings of that school of Naturalists, and especially those of Darwin. There is, indeed, in many respects, a similarity between him and Darwin. Thus, Hunter delighted in the minute observation of the habits of common plants and animals—as in the study of the motions of the tendrils of climbing plants,[86] of the 'sympathies,' as he called them, of the sensitive plant,[87] and of the economy and habits of bees,[88] wasps, eels, toads, lizards, hedgehogs, and bats. He noticed the bee laden with pollen entering and fertilising flowers, which, as he says, 'have no male parts'; he determined the difference between the pollen on the limbs of the bee, and the wax which he discovered to be a secretion formed beneath the abdominal segments, by the simple method of burning away the one, and melting the other, on the points of needles. 'As bees have a sting,' he remarks, 'so they are endowed with such powers of mind as to use it; their minds being extremely irritable.'[89] He describes their honey-bag, and he directs attention to their cleanly habit of evacuating their intestinal canal outside their hive;

[85] Vol. iv. pp. 44–9. [86] Vol. iv. pp. 200. [87] *Ibid.* p. 205.
[88] Vol. iv. pp. 422–66. [89] Vol. iv. p. 454.

and, to test this habit, he confined a certain number of them for several days, and watched them in the act of evacuation as they flew away, and, on sacrificing one, he found its intestine loaded up to its stomach. Like Darwin, too, Hunter often drew conclusions from the most trivial facts, as when he infers the existence of bile in the maggot from the bitterness of a bad nut, the imperfect digestive powers of a flea from its excrementitious deposits containing almost unchanged blood, and the dependence of caterpillars on the juices of plants, because he found their little green castings, when soaked in water and unrolled, to consist of minute portions of leaves. It may, indeed, be said that, during the lives of these two great searchers after Nature's laws, the economy of Earl's Court and of Down Cottage bore a certain resemblance; whilst, in death, it has been the fate of both Naturalists to lie in the same consecrated soil.

But it is time that I considered Hunter's mental attitude towards the present conditions of the sciences of morbid anatomy and pathology, and towards that of the modern practice of surgery.

A single sentence will suffice to point out that, the comprehensive character of our present *Morbid Anatomy* Collection, which completely overshadows the thousand and eighty-four specimens which Hunter left, the pains which have been taken to make it illustrative of every known form of disease, the labour of love undertaken by our distinguished Colleague, Sir James Paget, towards the completion of the corresponding Catalogue, and the

promise of future extension of the Museum, would not escape Hunter's appreciative recognition.

Hunter took care to distinguish between Morbid Anatomy, or the study of diseased structures, and *Pathology*, or that of diseased action, for he correctly defines 'pathology' as the 'physiology of disease'; and it is needless to say, that in regard to both of these closely allied branches of knowledge, he would admit the important and indispensable service rendered by microscopic research. Moreover, I will assume that he would accept as great generalisations some modification of the 'Cellular Pathology,' and the still more recent views on the influence of Protoplasmic action in the production of disease.

In his brief but interesting discussion on Tumours, Hunter defines a 'true tumour' as an 'entirely new part,'[90] so that to him the terms 'new formation,' 'new growth,' and 'neoplasia,' would be quite intelligible; nor would he be slow to perceive the scope of the term 'metaplasia,' the title of a Paper read by Virchow at Copenhagen, in which Hunter's name received early and honourable notice. Although the clinical distinctions between a 'cancer,' a 'fungated sore' (probably a sarcoma), and a 'scrofulous enlargement' were pretty clearly distinguished by Hunter, yet he expresses himself not always able to decide between them, and he would doubtless acknowledge the help afforded by the inspection of a few of our everyday microscopic sections; whilst many of his other pathological difficulties would be as rapidly dissipated.

[90] Vol. i. pp. 559, 631.

As regards the complex phenomena of inflammation, which Hunter had so long and so carefully thought out, it may be said in a word that the modern microscope, whilst adding so much to his knowledge, would elucidate and confirm almost all his sagacious conceptions. Those important agents in the inflammatory processes, the white blood corpuscles, though perhaps not altogether unknown, were not sufficiently distinguished in Hunter's time. The existence of these being granted, their amœbiform properties, their emigration through the softened walls of the small vessels, their further action on the tissues, their presence in lymph, and their identity with pus corpuscles, would fill up the details in the Hunterian sketch.[91] He saw that the increased action of inflammation 'most probably takes place in the smallest vessels,' but what it was, he confessed, is 'not easily ascertained.'[92] When suppuration is impending, these vessels, he says, 'begin to alter their disposition and action';[93] and pus itself, with the globules of which he was acquainted, he believed to be formed 'by some change, decomposition, or separation, which the blood undergoes in its passage out of the vessels.'[94] As to the subjects of the growth of new vessels in exuded lymph, which he called 'coagulating'[95] to distinguish it from a merely coagulable substance—the vascularisation of a blood-clot, which Hunter is careful to say 'either forms vessels in itself, or vessels shoot out from the original surface of contact into it'[96]—the formation, blood supply, and

[91] Vol. iii. pp. 324–6, and *loc. var.*
[92] Vol. i. pp. 365, 394.
[93] Vol. i. p. 411.
[94] Vol. i. p. 415.
[95] Vol. iii. pp. 17–20.
[96] Vol. iii. p. 119.

subsequent changes in granulations—and, lastly, the process of cicatrisation—these were so dealt with by Hunter that he would simply find them more fully explained, with scarcely any change. But it is evident that he would now modify his view as to the identity of the mechanism of interstitial or progressive absorption, with that of simple superficial ulceration.

As a *Clinical* observer, Hunter would undoubtedly, as occasion arose, avail himself of every modern method, physical or chemical, and of every new instrument or test, employed in the investigation of disease. In the use of the thermometer, he was far advanced; thus, he says, 'the standard heat of the human body is about 99°,' and he adds, 'I believe that degree is pretty regular'; [97] he found that it differed according to the distance from the centre of the body, that it was less in the morning than the evening,[98] and was diminished at night. He found in a special case that local inflammation could raise the local temperature, from 92° to 98¾°, or upwards of 6°, but he correctly concluded that this local elevation could not reach 'the standard heat of the constitution' at the time, 'nor even to it in parts far from the source.' [99] He observed on one occasion, the fluid of an inflammatory dropsy at a temperature of 104°, and heard, he says, of a temperature of 112° being found in fever. He believed, that 'nothing can increase that natural heat,' 'but some universal or constitutional affection'; [100] but he felt that the question was 'worthy of inquiry'; and he added,

[97] Vol. i. p. 289.
[98] Vol. iii. p. 341.
[99] Vol. i. p. 385.
[100] Vol. i. p. 385.

'our measurement . . . can be brought even nearer to the truth than is absolutely necessary to be known in disease.'[101] How interested he would be in the detailed temperature charts of the present day, as indicating the vicissitudes of the febrile state!

Hunter correctly enough drew a distinction between simple inflammatory fever and specific fevers of all kinds. He perceived clearly that 'hectic' fever presented peculiarities, but he disbelieved the opinion that it was due to the 'absorption of pus' as its proper cause. He ascribes to severe hectic, and to the grave condition which he calls 'dissolution,' symptoms so accurately defined by him that we may recognise the various transitional and now better-understood forms of pyæmia and septicæmia.[102]

Hunter's list of specific poison-diseases[103] contains a rather incongruous assemblage—for example, scabies and smallpox, the venereal disease in all its forms and cancer, hydrophobia, measles, whooping cough, putrid sore throat, agues, gaol distemper, and the plague. Scrofula, he thought, was a specific but not a poison-disease. He doubted the specific nature of erysipelas; but he attributes that character to carbuncles and boils. That he would seize with avidity the exacter knowledge of the present day, and thereby extricate himself from this confusion, is quite certain. In speaking of the specific fevers due to miasms, he utters this reflection: 'It may, perhaps, in time happen that the human race shall be exterminated by poisons alone; but it is more probable that many poisons are extirpated, and that

[101] Vol. iii. p. 337. [102] Vol. i. pp. 431–5. [103] Vol. i. pp. 615, 616.

new ones may arise in their stead every day.'[104] How this sentence chimes in with modern questionings as to the recent origin of scarlet fever and typhoid, cholera, and diphtheria! How it suggests the sight of Hunter endeavouring to grasp the possibilities of the issues involved in it, gradually gathering up the now well-ascertained facts concerning the organisms which are associated with anthrax and cattle plague, with tubercle and cholera, listening to the suggestions as to the possible modifiable or self-adaptive nature of these organisms, hoping for the means by which they may be checked, or, as he says, 'extirpated,' and, in short, gazing into that vista of conceivable triumphs over 'living contagia,' which seem to promise such grand prospects for the future of medicine and surgery!

In now taking leave of Hunter as a general pathologist, I cannot withhold the comment that, as in physiology, so in pathology proper, his views passed beyond the apparent limit of his subjects. Indeed, he associated the two sciences, and, as it were, blended them at their conterminous borders. He said that disease taught us what was health, as well as health informed us what was disease;[105] and he distinguished a healthy from an unhealthy inflammation. Besides this, he included all animal life in his pathological speculations, as when, for example, he speaks of the vessels at work in the process of absorption having 'more of the polypus in them than any other parts of the body';[106] and it is certain that he recognised the occurrence of morbid processes in plants, as indicated by specimens

[104] Vol. i. pp. 615, 616. [105] Vol. i. p. 220. [106] Vol. i. p. 256.

preserved in his Museum, and which he was accustomed to exhibit in his lectures.[107] We may be sure that Hunter would approve the close relations which have recently been established between physiological and pathological investigations, and would applaud any assistance which the College may hereafter offer towards the establishment of Laboratories devoted to Scientific Research.

In the study of one special disease, Hunter showed his usual acumen, and, in spite of the changes and subtleties of modern opinion, will rank with the foremost authorities of the present time. After long and continued study and grave experiment, he adopted the view of the unity of the venereal poison, including not only the soft and hard chancre, but even gonorrhœa, in its effects; and now, although the dual theory has for a time held its sway, he would find a strong inclination in the minds of many Surgeons to regard the two kinds of sores and their markedly different respective consequences as different manifestations of one poison, in different states or under different conditions. Speaking of the poison of the lues, which is his equivalent for syphilis, Hunter says, 'it produces fever which is of the slow kind.' 'In the first stage of the disease, before it begins to show itself externally, the patient has all the symptoms of an approaching fever. These symptoms, continuing for some days and often for weeks . . . . show that there is some irritating cause, which works slowly upon the constitution.'[108] 'It is then supposed to be whatever the invention or ingenuity of the prac-

[107] Vol. i. p. 391. [108] Vol. ii. pp. 422, 423.

evidence exists to show that he would not be wholly indifferent to the interests of that Department of the College.[19]

If we next regard John Hunter as an accomplished *Human Anatomist*, it needs only briefly to be said, that he could have no difficulty in keeping pace with whatever advances have been made, since his time, in the knowledge of the ordinary structure of the human body, as well as of the numerous varieties in arteries, muscles, and other parts, to which it has been shown to be liable.

The immense progress which has been made in the science of *Comparative Anatomy* since Hunter's days, could not fail to excite the liveliest satisfaction even in *his* well-stored mind. Countless as are the facts which have been brought to light by the combined efforts of succeeding comparative anatomists, from the time of Cuvier down to the present moment, they would all be welcome to him. To one who had spent thirty years in this field of study, and had himself dissected and described about 500 species of animals, vertebrate and invertebrate,[20] the diversified new forms and structures which would be presented to his notice, could not of course be accepted by him otherwise than as facts. Parts possessing functional significance would be promptly assigned by him to their respective places in his great physiological series. Special structures would be studied by him with even deeper interest; whilst he would quickly learn to appreciate the many novel and

[19] See *Hunterian Oration*, by Mr. F. Skey, F.R.S., 1850, p. 5.
[20] Vol. iv. p. 7.

titioner shall call it; but the venereal eruptions . . . . show the cause, and in some degree carry off the symptoms of fever, and relieve the constitution for a little time, but this soon recurs.' He likewise suggests that this fever might 'exist without the presence of local symptoms.'[109] Hunter, furthermore, describes exceptional cases, more or less resembling lues, in which peculiar and aggravated symptoms occur, such as extensive and obstinate sores, and falling of the nails, and which may even end fatally.[110] These, he says, 'show as much as possible that new poisons are rising up every day, and these very similar to the venereal in many respects though not in all.'[111] In reference again, to syphilitic affections of the bones, he remarks: 'Cases sometimes occur in which, after the venereal disposition has been corrected, another disease takes place in the bone, the nature of which will be explained when we shall consider the effects remaining after the disease is cured, and the diseases sometimes produced by the cure.'[112] His explanation is that 'new diseases' may arise from the mercury alone, or from 'different combinations' of the mercurial irritation, the venereal disposition, and the natural disposition, which he assumes may itself not be healthy. In many cases, he suspects that this natural disposition may be of a scrofulous nature;[113] but he would not exclude rheumatism and gout.

Considered as a *practical Surgeon*, present with us to-day, Hunter would find his capital operation of liga-

[109] Vol. ii. pp. 392, 393. [110] Vol. ii. pp. 390, 474. [111] Vol. ii. p. 477.
[112] Vol. ii. p. 448. [113] Vol. ii. p. 458

ture of an artery high up for the cure of aneurism, in some degree superseded by the improved method of compressing the artery in the same situation. He mentions having, in one of his cases, tried compression, he does not state where or how, but he gave it up, on account of the pain produced by it.[114] His own successive improvements in the actual operation, by the more limited exposure of the artery, the non-inclusion of the vein, and the use of one ligature more firmly drawn instead of four applied more loosely and with graduated force from above downwards—all steps calculated to minimise the necessary accompanying suppuration, the evil effects of which he had to deplore—show how gladly Hunter would have adopted the non-irritating silk or the absorbable catgut, cut short and left in a non-suppurating aseptic wound.

As a general rule, Hunter's treatment of wounds was as simple as possible. He employed very few local applications. His advocacy of scabbing by the drying up of all superficial sores was one indication of this, for it commended itself to him as arresting the suppurative process.[115] It is easy to understand how pleased he would be with the modern practice of skin-grafting; and the more serious operations of transplanting, under aseptic conditions, pieces of bone, and recently even of a whole muscle from one animal to another, would have struck Hunter as interesting advances on his own successful attempts to make the cock's spur grow in the comb, and to transplant human teeth.

Hunter's view that surgical operations were often a

[114] Vol. iii. p. 603. [115] Vol. iii. p. 585.

'tacit' admission of our inability otherwise to accomplish a cure, and that they should always be approached with 'a sacred dread and reluctance,'[116] would assuredly be qualified now, when, in so many new and bold operations, so great a measure of success is obtained, and that, without the suffering Hunter had to witness, destitute as he was of the welcome aid of Anæsthetics.

The great number of novel operations which have been devised since Hunter's time would, no doubt, astonish him; but, on the other hand, it is interesting to find that some of these would be more or less familiar to him. Thus, in reference to external herniotomy, he directs that in congenital hernia the sac should not be opened; he advises the 'extirpation' of varicose veins, as 'very proper, unless the disease is too extensive'; of course, the tunica vaginalis was cut open for the cure of simple hydrocele; he describes minutely the steps of an operation for the cure of unyielding urethral strictures, without or with false passage or urinary fistula, by laying open the distended urethra through the perinæum behind the seat of constriction, then passing a fine probe forward through the stricture, dividing this, and afterwards passing a full-sized instrument along the whole canal into the bladder.[117] Acting on a belief which is shared by many, that cancer is a local not a constitutional disease, that it is not hereditary, and only contaminates the system by spreading into it, he advocated as a duty the removal of every enlarged and hardened gland which could be detected in the axilla, in cases of cancer of the mamma,

[116] Vol. i. p. 210. [117] Vol. ii. pp. 254, 270.

whenever that could be safely accomplished, even those which, he mentions, are often detected when some have been taken away; lastly, he alludes to lumbar abscesses from which a urinary calculus had been removed, thus justifying a recourse to actual nephrotomy.[118]

As is well known, in reference to the operation of ovariotomy, Hunter says somewhat brusquely, 'If taken in the incipient stage, they' (meaning diseased ovaries) might be taken out, as they generally make life disagreeable for a year or two, and kill in the end. There is no reason why women should not bear spaying as well as other animals. It would simply be opening the cavity of the abdomen, which we often do without inconvenience in healthy constitutions.'[119] In speaking of peritoneal wounds generally, and the mode in which they are healed, Hunter drew upon his experience as a military surgeon, often alluding to the healing of sword wounds and gunshot wounds of the abdominal cavity, more especially in cases in which no viscus had been wounded.[120] He advised that the stitches of the abdominal suture should not 'pass through into the cavity of the abdomen, as they would interfere with rendering the cavity perfect; for, as these continue, suppuration of the wounds will come on, they acting as a seton, by which the exposure of the cavity will be greater, though, perhaps,' he continues, 'from the irritation they would occasion, adhesions would be formed at the bottom of the wound before this suppurates, which might prevent the admission of air.'[121]

[118] *Op. cit. loc. var.*
[119] Vol. i. p. 573.
[120] Vol. iii. p. 559.
[121] Vol. i. p. 448.

We perceive here the natural dread which Hunter had of that exposure of a wound or compound fracture to the air, which, his whole experience taught him, led to the dangerous suppurative, instead of that milder adhesive inflammation which ensued in a perfect cavity, or in a simple fracture, or in a subcutaneous or completely covered wound. The full precautions of the antiseptic method being explained to him, he would now have less fear of passing sutures through the whole thickness of the abdominal walls. Supposing suppuration of the peritoneal cavity to have occurred, Hunter observes, 'How far in such cases it might appear desirable to make an opening into the abdomen, and throw in warm water repeatedly, to wash away the matter, I will not at present determine.' [122]

The whole tendency of Hunter's teaching in regard to wounds being to prevent suppuration if possible, it was evidently a sorrowful confession on his part to say, 'It appears very difficult to give a true and clear idea of the whole of the chain of causes leading to suppuration.' [123] After mentioning ordinary instances of suppuration following exposure to air, he states 'these effects might appear to be due to the influence of air'; but, he points out, that air in emphysema of the areolar tissue does not do this, unless the skin be wounded, nor does it do so in the air-spaces or hollow bones of birds, unless these are laid or broken open. 'Air, therefore,' he continues, 'is not the cause of suppuration.' [124] Yet Hunter was aware that, before the opening of large ab-

[122] Vol. i. p. 446. [123] Vol. iii. p. 404.
[124] Vol. i. p. 410; vol. iii. pp. 405, 406.

scesses, 'patients are generally pretty well, but immediately after that time they become unhealthy and hectic, which continues till death.'[125] He recognised that the mischiefs, viz. of hectic and dissolution, *i.e.* of pyæmia and septicæmia, which followed large wounds, compound fractures, and amputations, appeared 'more in hospitals than in private practice, more in large towns than in the country,' 'often without apparent cause,' 'frequently in the most healthy persons,' and were rapidly fatal, a result not 'due to the sore as an immediate cause,' but certainly assisted by it, as the symptoms never occurred 'when the sore is healed.' For the cure of such cases, he adds, 'I do not find anything that has any effect.'[126]

Yet Hunter saw clearly that 'air could convey most poisons,' that the air of 'warm, moist places was the most impure,' and that 'the effects of an impure atmosphere are found in gaol distempers and hospital diseases; very few of the former places are ever free from foul air, and most hospitals are more or less affected with it.'[127]

If, therefore, Hunter had now demonstrated to him that, whilst mountain air contains minute organisms in units, country air in hundreds, town air in thousands, and hospital air in tens of thousands, and furthermore had explained to him the relations of organisms of this kind to the fermentative and putrefactive processes, the dangerous or fatal results of the entrance of septic matters from the surfaces of exposed wounds into the blood, and the established efficacy of so-called antiseptics in destroying

[125] Vol. i. p. 600. [126] Vol. i. p. 435. [127] Vol. i. p. 296.

such organisms, and arresting the decomposition associated with their presence, he would hail the discoveries of Pasteur and the triumphs of Lister with the gratitude they deserve.

In three places in Hunter's writings, I find that he uses the now well-worn term '*antiseptic*'—twice in reference to internal remedies, and once to external applications. In the treatment of hectic, he says, 'strengtheners and antiseptics are recommended. Strengtheners are proposed on account of the debility which has evidently taken place; and antiseptics, from the idea of absorbed pus going into the blood and tending to putrefaction.'[128] Again, in connection with the treatment of hectic, he says: 'Antiseptic substances have also been employed, such, for instance, as preserve dead flesh; but this is very absurd.'[129] The allusion to the external use of antiseptics is in relation to the local treatment of mortification. 'Scarifications,' he says, 'have been made down to the living parts, that stimulant and antiseptic medicines might be applied to them, as turpentine, the warm balsams, and sometimes the essential oils.'[130] Such local treatment, however, he regards also as absurd; and, although the agents thus enumerated are all antiseptic, from the point of view of perfect antiseptic surgery, this is true; for putrescence would already have set in. Yet Hunter speaks of tar water and turpentine as often productive of great good as local applications in certain cases, and laments that these and other remedies 'sometimes fail, and that we do not possess a sufficient number for the

[128] Vol. i. p. 434. [129] Vol. i. p. 604. [130] Vol. iii. p. 8.

variety of constitutions we meet with.'[131] His felt want could now be easily supplied.

There is one feature of the modern practice of surgery which could not fail to be noticed and commented on by Hunter; and, at first, he would probably disapprove of it, as a departure from the simplicity of the art which he practised. I mean the growth of *specialities*. But this, he would soon find, is a necessity as well as a cause, of the immense accumulation of facts and knowledge since his time; and he would become reconciled to it, with all the special instruments and other appliances which modern ingenuity has devised.

There is, however, one speciality, which, as a great Surgeon as well as a great experimentalist, he would be doubly prepared to receive with acclamation, viz. the discovery and use of Anæsthetics, as one of the greatest boons ever conferred on sensitive beings, whether animals or man.

There are other topics and suggestive passages in John Hunter's writings on which some comment might here be made,[132] but I have selected those most suitable to my purpose. Others necessarily contain certain erroneous statements and conclusions, due to want of more full and accurate knowledge, and occasionally to defective reasoning. Nevertheless, there is hardly a chapter from which some information might not be taken, or some benefit derived. It is also evident that the Commentators, in the collected edition of his works

[131] Vol. i. p. 557.

[132] See Appendix B. The italics are mine.—J. M.

published in 1835 (that is, just fifty years since), are not unfrequently in error. These works themselves deserve to be re-edited.

How is it that we can look back over the intervening century since Hunter was in his prime, and find him so at one with us and ourselves so in harmony with him? This unison neither implies a supreme prescience on his part, nor a standstill in science and practice, continuing to our day. On the contrary, there are hosts of facts, familiar to us, which he did not know, and there have been evolved many opinions and conclusions in advance of his speculations and doctrines. It is, as I have endeavoured to show, because our work and thought to a great extent pursue the lines which he has laid down. The issues in which we join were his; the instruments and weapons may have improved, but the strife and the method are the same. We believe in observation and experiment, and Hunter devoted his whole active life to both; he waited for long years to complete his labours and to mature his reasonings; and though unfortunately interrupted by his sudden death, the main results of his labour are secured. He followed Nature, and endeavoured to detect her ways, for the benefit of his fellow-men. We, in our time, are aiming at the same great end.

It has often been held as a matter of reproach, in regard to John Hunter's philosophy, that he too palpably personified Nature, looked always for 'Final Causes,' and attributed to the living organising principle, or 'Principle of Life,' or even to parts of the body in which it acts, a consciousness of its own

actions and intentions. Thus he speaks of the 'consciousness of want of power' and 'the stimulus of the necessity of being stronger,' as the causes of a weakened muscle gaining strength. Speaking of the impairment of a muscle's force when its tendon is injured, he says this arises from a consciousness of the 'injured parts being unable to answer to the action of the muscles,' and it 'comes nearest,' he adds, 'to human reason, of anything in the body.' A 'deficiency in the power to heal becomes a stimulus to inflammation.' 'The desire to retain and preserve important parts accounts for efforts at restoration and repair'; 'the stimulus of perfection' plays a part in causing the descent of the testis; 'the stimulus of death' causes the rigor mortis; the 'complete recovery of power' in an organ after the cure of an injury is thus explained, because 'it may be, like the mind, forgetful of injuries.' The 'consciousness of imperfection' in a diseased part leads to its absorption; and, in this process, he says, 'the part to be absorbed is alive, it must feel its own inefficiency and admit of absorption; the vessels must have the stimulus of imperfection of this part, as if they were sensible that this part were unfit; therefore take it up. There must be a sensation in both parts.'[133] But surely, when duly considered, the language of these quotations must be regarded as largely figurative, and springing from a craving and a struggle to divine the motives of Nature; and, at all events, they should not be taken as meant for explanations of the vital processes concerned. If, indeed, we consider other and still more direct evidence of his

[133] Vol. i. p. 255.

adhesion to the then prevalent doctrine of 'final causes,' we discover proof that his thoughts were only partly entangled in the teleological net; and that his mind struck out freely to investigate the modes of action by which the end or final cause was to be obtained. If, for example, in his morphological and physiological studies, he sought to explain form by use, and structure by its adaptation to function; and if, in his pathological researches, he accounts for the coagulation of the blood, the occurrence of the adhesive process in inflammation, the formation of pus and its tendency to the surface, the growth of granulations and of new cuticle, the occurrence of eruptions in fever, and other diseased actions, by a reference to their occasionally beneficial effects or salutary ends—all this did not prevent his admitting, that not infrequently these same morbid processes are sadly detrimental in their results, that he often failed to detect what the intention of Nature might be, and that, sometimes, it would have been better if she had acted differently. Here, again, though he sought diligently for final causes to satisfy one want of his mental constitution, yet he never rested there. He desired to know the 'how' as well as the 'why,' and he therefore occupied himself diligently and constantly in the observation of Nature's ways, and in experiments on her living products and their actions. 'It is astonishing,' he says, 'to see what little curiosity people have to observe the operations of Nature, and how very curious they are about the operations of Art;' [134] and he clearly discerned in all his proceedings, that no perception of the end arrived at by

[134] Vol. i. p. 527.

Nature really afforded any explanation of the processes she employed. His chase after final causes meanwhile gave a zest to his inquiries, but a close acquaintance with Nature's actual work was needed to find food for his intellectual appetite. If, too, we reflect on his modesty in the expression of his opinions, as when he uses such phrases as 'I conceive,' 'I suspect,' 'I do suppose,' 'I am apt to suppose,' and others of a like character, and on his horror of definitions, which, he says, 'of all things on the face of the earth are the most cursed,'[135] on his occasional avowal of ignorance and candid statement of facts adverse to his opinions, and on his incessant promises to satisfy himself by experiment—I think we may conclude that, in the fields of both Science and Practice, his mental constitution was as philosophical as the work he performed in the world is far-reaching and gigantic.

I have now, Mr. President and Gentlemen, almost fulfilled the duty assigned to me; but I have as yet said not a word of John Hunter's personality. He is described to us as having been 'about the middle stature, of a vigorous and robust frame, and free from corpulency; his shoulders were high and his neck short; his features were rather large, and strongly marked; his eyebrow projecting; his eyes were of a light colour, his cheeks high, and his mouth somewhat under-hung. In dress he was plain and gentlemanlike; and his hair, which in youth was of a reddish yellow, and in his latter years white, he wore curled behind.'[136]

[135] Vol. i. p. 217.

[136] Vol. i. p. 133, in Drewry Ottley's *Life of John Hunter*.

In Reynolds's fine portrait, which, as is usual on these occasions, is placed before you, he is represented sitting, self-contained, abstracted from all surroundings, absorbed in pleasurable thought. Looking at his face, we may well agree with the great master of physiognomy, Lavater, who said, 'that man thinks for himself'; and we may feel that he appears equal to the conception and accomplishment of all he actually did.

About a century has elapsed since that picture was painted; and Hunter at one time, when engaged in observing the effects of cold on animals, indulged, like some others, in the fancy that a man might be frozen for a time, and then, as he says, 'by getting himself thawed every hundred years, he might learn what had happened during his frozen condition.' 'Like other schemers,' he adds, 'I thought I should make my fortune by it; but this experiment undeceived me.'[137]

I have to-day endeavoured to revive him, not in body, but in spirit, conversant with our present position in Science and in Practice, and supposed to be studying a vast crowd of additional facts, contemplating fresh generalisations and putting new methods to the test. Our acknowledged Teacher, he would find much to learn; but what true teacher is not eager to be taught? Hunter would be an apt student, in harmony with us in thought and plan, hand to hand with us in work and deed. His fitness to understand all that we have since discovered, and to co-operate with us in all our novel doings, constitutes in truth his best claim to the lofty title, recorded above his grave, 'The Founder of Scientific Surgery.'

[137] Vol. i. p. 284.

And, now let me repeat, before I retire, that I recognise our presence here to-day as an act of homage to our great predecessor. I desire also to express the pleasure which I have experienced in the preparation, and I may add, in the delivery of this Oration. The hour at my disposal is rapidly expiring; and the moment is at hand when the ever on-coming future, traversing the imaginary film of time which is the only real present, will be for ever merged beyond it in the past; and I am well content that my last utterances from this place, spoken between the two eternities, should be the name of that grand Biologist, that illustrious Master in our noble Craft—JOHN HUNTER.

# APPENDIX.

## A. (*Page* 12.)

A HISTORY and description of the Hunterian Museum, as it existed in 1835, will be found in Drewry Ottley's 'Life of John Hunter,' prefixed to Palmer's edition of Hunter's works, vol. i. pp. 145–188.

A full and interesting account of the growth and condition of the Museum of the Royal College of Surgeons up to the year 1881 will be found in Professor Flower's Inaugural Address, delivered as President of the Section of Anatomy, at the International Medical Congress, held in London in that year. This address is published in the Transactions of the Congress, vol. i. pp. 133–144.

A very important critical notice of John Hunter's claims as a human and comparative anatomist and a physiologist is to be found in the 'Preface' to the fourth volume of the aforenamed edition of his works, contributed by Professor, now Sir Richard Owen, F.R.S., vol. iv. pp. i–xl.

## B. (*Page* 47.)

In confirmation of the statement in p. 47, I am tempted to add the following quotations, with brief remarks upon each. The quotations, preceded by proper references, are arranged in an order corresponding with that observed in the Oration itself.

*Minute Anatomy and Physiology.*

III. 85. 'As the globules are the coarsest part of the blood, and they appear to be fully affected by the air in the lung(s), we may suppose that the vessels of that viscus do not run into *extreme minuteness*, by which, apparently, no other purpose would be answered.' The pulmonary capillaries are very large.

III. 117. 'It is probably impossible to say where the living principle first begins in the blood; whether in the chyle itself, or not till that fluid mixes with the other blood, and receives its influence from the two lungs. I am, however, rather inclined to think that *the chyle is itself alive*; for we find it coagulates when extravasated.' From recent researches, the chyle appears to be formed *by the agency of the epithelial cells* covering the villi of the small intestine—that is, by a vital process.

III. 93. 'It appears to me impossible to ascertain *the quantity of blood in the body*, and the knowledge of it would probably give very little assistance towards better understanding of the economy of the animal.' This is a subject on which modern physiology has thrown much light, and led to important practical inferences.

III. 166. 'We know that all vessels in animals *endeavour as much as possible to adapt themselves* to the quantity of fluid circulating through them.' This fact is now recognised as of the highest physiological and pathological importance.

III. 64. 'In the living body, by making it an object of sight, they (the red globules) give some idea of the motion of the blood in the *smaller vessels*, where it is much divided; being there viewed with microscopes, the red globules are seen moving with different velocities in different parts, and taking retrograde or lateral motions, according as mechanical obstructions or those arising from *contractions in the vessels* may happen to retard or change their motion.' This will bear comparison with a modern description of Ischæmia.

I. 284. As regards the cause of animal heat, *this* was not a

bad supposition. 'I own I had formed an opinion on the subject; I rather supposed that *animal heat* was owing to some *decomposition* going on in the body, and *in pretty regular progression*, though not the process of fermentation.'

### *Experiments.*

IV. 258, 259. It would seem that Hunter, in experimenting to ascertain what change of bulk takes place in muscle during its contraction, was the first to adapt an upright *tube* to the vessel of water in which the muscular mass was immersed, the object being, as he says, 'to *give great nicety*' to the experiment.

III. 76; IV. 169. In these two places will be found a description of an ingenious *double bellows* for performing artificial respiration, in experiments made with the view of testing the probability of saving the lives of persons *apparently drowned* by employing similar bellows adapted to the mouth or nostrils.

IV. 46. Hunter's experiments on the power of the stomach to *digest itself* were absolutely conclusive, and his comments most admirable.

### *Zoology, &c.*

The following quotation (which, however, relates to deep-sea animals) will be interesting to the supporters of marine Zoological establishments:

IV. 331. 'The animals which inhabit the sea are much less known to us than those found upon land, and the economy of those with which we are best acquainted is much less understood; we are, therefore, too often obliged to reason from analogy where information fails, *which must probably ever continue to be the case*, from our unfitness to pursue our researches in the unfathomable waters.'

In his description of the kangaroo and other marsupials (the first which appeared of some of these singular quadrupeds),

Hunter uses a now familiar phrase; for, apropos of specimens sent home from abroad, he says,

IV. 482. 'The subjects themselves may be valuable, and may partly explain the connection with those related to them, so as in some measure to establish their *place in nature*,' &c.

I. 67. Hunter saw the propriety of '*matching*' his fossil shells, as far as he could, 'with the recent.'

IV. 473, 476, 477. He also compared fossil with recent bones; and from his discussion on some cave-bone fossils sent to him for examination, we learn that his conception of *geological time* was by no means limited, for he writes quite freely of 'vast series of years,' of 'many thousand years,' and of alternations of sea and dry land—the sea being spoken of as 'occupying a place, and leaving it, and returning, and remaining thousands of years.'

*Pathology.*

III. 33. Hunter relates that two leeches contained fluid blood for 'ten weeks;' and, elsewhere,

I. 538. Hunter says, 'I conceive that leeches occasion a free discharge of blood by their having a specific power, or acting as *a poison on the vessels*, so as to weaken them and prevent their contraction thereby.'

These well-known facts have quite lately been made the subject of experiment, and it has been shown that the leech probably secretes a '*ferment*,' which prevents the coagulation of the blood. May it, as Hunter suggests, also 'prevent' the contraction of the smallest arteries?

III. 31, 33. Hunter thus discusses the effect of living and dead vessels on the coagulation of the blood. 'Therefore,' he says, 'the contact of blood with blood, or with living vessels, in some degree retards coagulation'; it 'coagulates when the vessels or the body dies'; 'it might naturally be supposed that it was the life of the body or vessels which kept it fluid; we know, however, that life in the body or vessels does not hinder the blood from coagulating *under certain circumstances*, but

*often* rather *excites coagulation.*' These 'circumstances' are, obviously, in Hunter's mind, injury and consequent inflammation.'

I. 602. In regard to the causes of mortification, Hunter says, 'I have suspected something like a *spasm of the small vessels*, but I cannot be certain.'

III. 445–8. Hunter followed the rate at which pus is formed, or the *progress of suppuration*, on inflamed serous membranes and other soft parts, by covering them with pieces of talc, and examining them hour by hour, so as to determine the gradually increasing rapidity of the formation of the pus.

I. 417. He rightly concludes that pus is not the result of the solution of the 'solids' of the body, but that it is formed 'from the fluids alone, by the action of the living solids.'

III. 581. The whole of this Paper on 'Inflammation of the Internal Coats of the Veins' is most admirable, and might almost all have been written to-day.

I. 533. 'Rickety people are generally knock-kneed, from *one condyle being less than the other*; it always is somewhat less, unless in bow-legged people.' The anatomical condition of genu valgum is here clearly laid down.

I. 498. Speaking of the large amount of attention which has been paid to diseases of bones, Hunter says, 'Bones being less subject to changes after death than the soft parts, are therefore more favourable for the exploration of their diseases after death, such as ulceration, tumours, &c.; and diseased bones of all kinds may be picked up in churchyards.' He also paid particular attention to the effects of time and soil on buried and fossil bones, and to the differences produced, according as bones were buried with or without the soft parts attached to them.

II. 488. With reference to diseases resembling the lues venerea, he says, 'I cannot conclude without intimating that undescribed diseases resembling the venereal are very numerous; and that what I have said is rather to be considered as hints for others to prosecute this inquiry further, than as a complete account of the subject.'

*Surgery and Medicine.*

III. 260. The importance of 'rest' in the treatment of disease was fully recognised by Hunter, who says, 'The first and great requisite for the restoration of injured parts is *rest*,' &c. And again, 'The same *principle of rest* should apply to *every injury*, although this is not often allowed to be the case.'

III. 253, note. 'If such a wound has a depending angle, and the vessels should even be tied nearer the upper angle than the lower, yet I would advise to bring the loose end of the thread out of the wound *at the lower*, for by that maens the matter will flow much more easily.' Here 'drainage' is distinctly inculcated, though not by means of a tube.

I. 541. As a means of stopping local hæmorrhage, Hunter says, 'I have sometimes thought of trying *boiling water*,' a method now sometimes employed.

III. 245. Hunter describes a very interesting case in which, to his surprise, a large hæmatoma was successfully treated, without bringing on suppuration, by making a *minute puncture into it*, through which the coagulum was gradually forced out, day by day, whilst the cavity contracted upon it, and finally closed up. This slow and quiet extrusion of a clot, which would be quite exceptional under septic conditions, might now be often shown to Hunter to occur in the case of deep-seated wounds treated aseptically.

III. 372. In speaking of the increased size of the vessels in inflammation, and the desirability of obtaining their *contraction* as a part of the treatment, Hunter says in a note:

'As this is a new theory of the action of the vessels in inflammation, and the only one that can possibly direct to a *method of cure*, it is to be hoped that attention will be paid to it, and if just, that more certain methods of restriction will be discovered.' Again (p. 384), 'If we had medicines which, when given internally, could be taken into the constitution, and were endowed with a power of *making the vessels contract*, such, I apprehend, would be proper medicines.' The local

effects of solutions of atropia in conjunctivitis and of glycerine of belladonna in inflammations of the skin and subcutaneous areolar tissue, and of the mammary or salivary glands, would respond to Hunter's expectations.

IV. 141. Hunter found that whilst 'a bottle of *wine* increased the pulse from 73 to 87,' the *temperature* in the rectum of a man *remained unaltered*, viz. 98½°.

III. 513. He, elsewhere, says, in reference to the treatment of hectic, 'I have not yet made up my mind about *wine*.' That is, he thought it might 'increase action,' without giving 'strength.'

IV. 170-5. The general advice and instructions given by Hunter in his 'Proposals for the recovery of persons apparently drowned,' which 'endeavour,' he observes, 'is a new practice,' are very excellent; but, although he says 'motion may possibly be of service, it may at least be tried,' he would have to learn the advantages of the systematic and rhythmical movements advised by Marshall Hall and Sylvester, as now employed. He gives a most important hint, the necessity for attending to which I have frequently had occasion to point out in threatened asphyxia from chloroform, viz. to 'enjoin those employed to observe with great attention when the muscles of respiration begin to act, that our endeavours may *not interfere* with their natural exertions, yet that we may still be ready to assist.'

III. 624. Hunter called in to his aid an ingenious watchmaker, to make a *tube* for passing food directly into the stomach in a case of paralysis of the muscles of deglutition. It consisted of a whalebone probang with a sponge attached, over which an eel-skin was drawn and secured close to the sponge. A slit in the eel-skin above the sponge allowed the nourishing fluid to escape at that point; whilst a bladder, containing the fluid, was fastened by means of a wooden pipe to the other end of the skin. An interview with a modern surgeon's instrument maker would lead to the purchase of a more elegant œsophageal tube and syringe.

II. 123. P.S.—I may be excused for ending these quota-

tions with the following one relating to Hunter's 'Treatise on the Venereal Disease.' He says, 'In order to render the language intelligible, I meet a committee of three gentlemen, to whose correction every page is submitted.' In a note to this passage, Mr. George Babington states, 'The three gentlemen were Dr. (afterwards Sir Gilbert) Blane, Dr. George Fordyce, and Dr. David Pitcairn, and with these Mr. Marshall appears to have been associated.'

LONDON: PRINTED BY
SPOTTISWOODE AND CO., NEW-STREET SQUARE
AND PARLIAMENT STREET