The Hunterian oration delivered at the Royal College of Surgeons of England on the fourteenth day of February 1863 / by George Gulliver.

THE HUNTERIAN ORATION

DELIVERED AT

THE ROYAL COLLEGE OF SURGEONS OF ENGLAND

ON THE FOURTEENTH DAY OF FEBRUARY

1863.

SECOND EDITION.

EA SUB OCULIS POSITA NEGLIGIMUS; PROXIMORUM INCURIOSI,
LONGINQUA SECTAMUR.—*Pliny.*

SOMETIMES BY THE THOUGHT RESTRAINED,
THAT THINGS FAR OFF ARE TOILED FOR, WHILE A GOOD
NOT SOUGHT, BECAUSE TOO NEAR, IS SELDOM GAINED.
—*Wordsworth.*

BY

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ADVERTISEMENT.

This discourse was meant only for the occasion, but is now presented in compliance with a desire expressed at an Ordinary Meeting of the College, as follows :—"It was resolved that the thanks of the Council be given to Mr. Gulliver for his Oration, and that he be requested to publish the same."

A few short explanatory notes have been added.

The above was prefixed to the first edition. A second edition being called for, the first is now reprinted without any alteration, except a very few verbal corrections.

Canterbury, January, 1880.

THE

HUNTERIAN ORATION.

Mr. President and Gentlemen,

It has often been said that the materials for these Orations are nearly exhausted, and that it is a hopeless task to seek so often for anything new or interesting on so limited a subject. But from the general tenor of this opinion, notwithstanding its support by Mr. Hunter's last biographer*, I must beg leave to dissent, and not without expressing some surprise at such a sorry representation of us, as unable or unready to find in the great book of Hunter an appropriate text for our instruction —matter "to point a moral or adorn a tale" in the rich chapters of physiological history—as if we, to whom his fame has descended as an honourable heirloom, were becoming indifferent to that precious bequest which it is our duty to cherish, and in which it is to be hoped we shall never fail to feel a just pride and to take every fitting opportunity of rejoicing. "So limited a subject"! Why, is there a student here who does not know that the genius of Hunter embraced almost the whole domain of organized nature, that he became its Evangelist since the revival of letters, and left such records of it as never one human hand and mind had done before? Admitting the difficulty at this day of infusing absolute novelty into our comments on these valuable records, surely there may and ought to be a relative freshness, and even a perennial interest and instruction, in reviewing the works of a man of genius in the now steady and now fitful lights and shades of advancing science. And a more grateful homage than this could not be paid to the memory of a great man. It is to view his reputation in the very glass in which he himself would like to see it were he to reappear among us; and, though he be dead, to show how "he yet speaketh."

By the book of Hunter, we mean the grand exposition of the works of nature to be found in his magnificent Museum as well as in his writings. These last contain some parts which have since been supplanted by better matter, and others which were not even equal to the knowledge of his time; though we cannot fail to admire the vast number of truths displayed in

* Mr. Ottley's Life of John Hunter, in Mr. Palmer's edition of his Works, i. 146.

those publications and so formed into a consistent whole, with the illustrations of his Museum, as to afford a beautiful example of what poor things mere detached or heterogeneous facts are, compared to what they may be when touched by the magic wand of genius and seen in the light of comprehensive and methodical truth. Thus, indeed, has Hunter established the most important era of modern times in physiological science, and left an imperishable boon to his successors, in the foundation of philosophical surgery, justly the pride of his school, the honour of which, so long as we can appreciate it, will be reflected on us and on our profession.

And, as Coleridge perceived, he has done still more. In Hunter's time zoological science was so oppressed by heaps of facts as to be in danger of sinking under their number, confusion, and weight, until he so surveyed and arranged them as to show their affinities and contrasts. Long before, indeed, there had been a sort of dead order, which it was reserved for his genius to mould or digest by expositions of relation and difference, of unity with progression or continuity of transition or development, into a living method. No one can properly contemplate his unrivalled Museum, "constructed for scientific apprehension out of the unspoken alphabet of nature," in connexion with his writings, without perceiving this great truth, nor without being impressed with the force of evidence by which the master spirit was led to the impressive and crowning conclusion that life is either independent of or precedent to organization,—recalling the Active Nous of Aristotle.

Moreover a somewhat familiar acquaintance with Hunter's works has long since taught me to look up to him as the foreteller of many principles or central phenomena only recently become well known by new or improved means of research, and claimed accordingly as late discoveries in utter ignorance or disregard of his earlier observations. Among other instances, his description of the leading fact in the formation of the buffy coat of the blood is particularly worth notice, not merely from its importance, but also because his priority in this respect was so little known or even suspected, so long completely hid, that it was pointed out only a few years ago* how he had anticipated the main result of the excellent observations of Schroeder Van der Kolk, Nasse, Henle, Wagner, and Wharton Jones. We have no time now to devote to this very interesting subject; but I hope in my next course of Lectures to introduce and explain diagrams of comparative microscopic analyses of such thin layers of blood as Hunter described,† showing, first, the red corpuscles

* Note xxi. to Hewson's Works, printed for the Sydenham Society: 8vo, London, 1846.

† Lecture ii., figure 16, reported in "Medical Times and Gazette," October 17, 1863.

of healthy blood scattered, and then collected into the well-known rolls with small interspaces of liquor sanguinis, and finally such rolls in buffy blood further attracted together laterally into clumps, with larger interspaces of that fluid, so as to produce the mottled appearance and spots of red observed by Hunter, and this by that very increased disposition of the blood to separate into its component parts to which he so truly attributed the phenomenon*.

Nevertheless, while thus careful that his originality be not unfairly ignored, we should be equally solicitous not to attribute to him the merit of discoveries to which he has no just claim---a caution the more needful, as such mistakes have been too often committed, of which an example is afforded by the assertion that it was not known till he demonstrated it upon what part of the blood its spontaneous coagulation depends, which erroneous statement, by the then Hunterian Professor, still stands, never yet corrected by its author, in the preface to the 4th volume of the last edition of Hunter's Works. Hunter's genius needs no meretricious tribute. We have been taught by a great poet to "look through nature up to nature's God"; and may we not in a like spirit of reverence regard her prophets? We should ever remember that it was Hunter's river that fertilized the physiological fields of Europe, comparatively barren before:

> "O could I flow like thee, and make thy stream
> My great example, as it is my theme!"†

It would, however, be a very hopeless task to attempt, in the single hour allowed for this Oration, anything like a satisfactory view of Mr. Hunter's labours, although it seems to me that this might be done in a number of successive orations, especially when the subject has received so much elucidation from my predecessors. To this end, we have only to choose some remarkable truth on which the genius of Hunter shone, to note the state of existing knowledge just before he found that truth, and finally to survey it by the lights of modern science. This is the course I propose for the present occasion; and, far from feeling any want of matter, it so abundantly crowds before the mind that the chief difficulty is one of selection.

While our science lasts, no time can fade, nothing stale the infinite variety and value of Hunter's works, provided proper care be taken of them. But this involves a great amount of labour and expense, which must accrue with the growth of the Museum, and which your Council has met and is prepared still to meet, if not always most judiciously, certainly with becoming zeal and liberality, sparing neither pains nor cost in pursuit of this primary object, and it is to be hoped, with a due sense of

* Mr. Hunter's Works, ed. by Palmer, i. 235, 381.
† Sir John Denham.

the importance of the great and pure well of Hunterian biology. Of such care, the single example of the Descriptive Catalogues and Memoirs, amounting to no less than 29 quarto volumes (besides the 8vo Synopsis), often richly illustrated by skilful artists, will afford strong evidence. Truly this is a magnificent series, of which our College may be justly proud, both as a fitting tribute to the memory of Hunter, and as a comprehensive and particular account of the design and contents of the present Museum. And no wonder, seeing what those volumes represent, and that they were drawn up with the aid of the Hunterian MSS. and published writings,—continued, expounded, or composed originally by such of his followers as the Clifts, Owen, Quekett, Paget, Stanley, Morris, and Taylor, occasionally with the valuable co-operation or assistance, in their respective departments, of Bowerbank, Gray, Gerard, Holdsworth, Rupert Jones, Murie, W. K. Parker, Stewart, R. F. Tomes, and Adam White. Probably there were other aids; but these are the only names I have been able to glean. It is supposed that Sir Wm. Blizard may have had a share in the compilation of some of the earlier volumes; and I believe it is not doubted that he took great interest in the good work. However, it must not be supposed that we now pretend to give a history of the Catalogue, much less to attempt any description of the relative labours of its authors, or compilers, as there is only time to take a passing notice of the most prominent efforts of your successive Councils in this momentous business. And I may add, from personal and painful experience while I was Chairman of the Museum Committee, that this paramount duty was not always prosecuted without difficulties of a very unexpected kind, though the larger part of it had been done before I had the honour of a seat in your Council*.

But, time pressing us no longer to delay a choice from the exuberance of riches, we will at once select the Fibrin of the Blood as an interesting, and instructive example—considering it not discursively, but specially in relation to certain points of its anatomy and physiology, and not forgetting that this was the central and darling point of Hunter's long labours on this great argument. As we have already hinted, the fibrin was well known to be the spontaneously coagulable matter of the blood years

* Mr. Thomas Stone obliged me with a sight of some MSS. of Mr. Clift, containing sad complaints of his interruptions while writing the Catalogue. The eminent labours subsequently therein of Owen, Quekett, and Paget are well known. Of the Memoirs on the Pearly Nautilus and Mylodon, Professor Owen is the author; and the Memoir on the Glyptodon, now judiciously entrusted to my colleague, Professor Huxley, will probably prove no less valuable. The volume on the fossil invertebrates, many of them Hunterian, might have been indefinitely delayed but for the able assistance which the Council happily obtained from Mr. Morris.

before his time; and the fibrin of the clot had been accurately described by Malpighi, Borelli, Ruysch, and others on the Continent, and by Samuel Collins in England; while in both countries the membraniform appearance of the fibres had been clearly observed, as well as the true nature of the so-called polypi of the heart and of the buffy coat of the blood. Yet these excellent observations, though current for a while, were afterwards hid and the fibrin ignored, during a strange reign of fancy in physics and poverty of imagination in poetry. In France the truth began to revive under the care of Petit, Senac, and Quesnay, only to be smothered a second time by a general and protracted ignorance or forgetfulness of the true properties of the fibrin. It was utterly lost or overlooked again. Accordingly, coagulation of the blood was either attributed merely to a change in the serum, to an aggregation of the red corpuscles, or to a new arrangement of imaginary colourless nuclei of these corpuscles supposed to run together so as to form the strings of fibrin. It is remarkable that this last error, which was general on the Continent up to the year 1832, though originating from Sir Everard Home and Mr. Bauer, never prevailed in Britain. Still the error of attributing coagulation to a running together of the red corpuscles did; it was the current doctrine, until it was upset finally in 1760 and 1770, and the truth thenceforth proved, established and evermore maintained here, by the exact and conclusive experiments of Dr. Richard Davies and Hewson. And thus Mr. Hunter neither has, nor could he ever have pretended to, any claim whatever to the discovery of the coagulable principle of the blood, nor indeed of the simple distinctive characters either of this or of the other two proximate principles of that fluid. He proved experimentally that no heat is produced in the act of coagulation, and that the fluidity of living blood is not caused by its warmth, and truly observed that a clot of fibrin may be "as tough and elastic as the coats of an artery, to appearance becoming fibrous, and even forming laminæ . . . . . which gives us a clear idea how a membrane may be formed, and probably can be varied according to the impression made on it by the surrounding parts."*

Here then he was entering on the special vital properties of the fibrin—a step as much in advance of the ancient and true doctrine of the life of the compound blood as any discovery would have afterwards been to a similar effect of any other proximate animal matter. In the same category he included the property which the fibrin possesses of coagulating spontaneously—an opinion which I have elsewhere shown to be very questionable †. But when he showed how the fibrin can be or-

* Hunter's Works, edited by Palmer, iii, 24.

† Hewson's Works, printed for the Syd. Soc., p. 21; and 12th College Lecture, reported in Med. Times and Gaz., Feb. 28, 1863.

ganized by the development within it, or from contiguous parts, of blood-vessels, and assimilated with those parts; how it forms the early bond of union in and the first step for the reparation of wounds; how it closes up divided arteries, and has the power of forming blood-vessels in and by itself *; he had fairly reached a field of inquiry which was far beyond the knowledge of his time, and which produced such fruits as gave a new and improved feature to physiological and surgical science. If he too much confounded the compound blood-clot with the more simple one of fibrin, it was with the clearest knowledge that this last is the solid framework or texture, elastic, fibrous, or laminated, "giving us a clear idea how a membrane may be formed and varied according to the impression made on it by the surrounding parts." An indication this of a central phenomenon, no less striking and important for us than when it first appeared with all the charm of novelty, and to which the observation of Dr. Davy, on the influence of the viscidity of semifluid fibrin on the forms of false membranes, is an interesting addition. That novelty is now gone; but I am old enough to remember when it yet lingered among us, and hope that at least a few of my superiors here may retain equally pleasurable reminiscences of the subject. To the minds of Hunter's disciples, contemporaries or immediate successors, it was a sort of spell. On this question the respected and venerable Clift, in his proud sanctuary of the Museum, might have had his enthusiasm ever and anon lit up most delightfully by the student visitor; and when some of our great teachers, as the late Mr. Abernethy, had well wound up the soft melody of their eloquence on the vital endowments of the coagulable lymph of Hunter, the warmth of their admiration and reverence was like

> "An Orphic tale of high and passionate thoughts
> To their own music chaunted!" †

The idea of these vital endowments of the fibrin was far beyond the knowledge of the fine old observers, such as Harvey, Malpighi, Borelli, and Samuel Collins. The first had a very just and exalted doctrine of the life of the compound blood; and the three latter, as well as Ruysch, distinguished that part of it which is spontaneously coagulable, besides its form and texture when coagulated; but that was all. It was left to the genius of Hunter to invest the fibrin with a special dignity never dreamt of in their philosophy, just as one touch of nature's own poet may give an enduring interest and importance to familiar, lowly, and commonplace objects. Now this doctrine of Hunter was current in the schools while I was a pupil, and remained so up to the advent in this country of the cell-theory of Schleiden and Schwann, by which the leading tenet of Hunter has been for

* Hunter's Works, edited by Palmer, iii. chap. i. § 6.
† Coleridge.

many years eclipsed, and indeed supposed to be put out evermore; but with what justice, we shall be better able to determine after such evidence has been adduced as, it is hoped, may lead you to reconsider if not reverse that verdict.

"All the organic tissues," says Professor Schwann, "however different they may be, have one common principle of development as their basis, namely, the formation of cells; that is to say nature never unites molecules immediately into a fibre, a tube, and so forth, but she always in the first instance forms a round cell, or changes, when it is requisite the cells into the various primary tissues as they present themselves in the adult state. . . . . The simplest form which animal matter assumes is that of a nucleated cell. . . . . The most elementary form with which we are acquainted is that of a cell, containing a nucleus within it, which again contains a granular body. . . . . This appears to be the primary form which organic matter takes when it passes from that of a proximate principle to an organized structure." Thus far Schwann and his followers. All this and even more to the same effect is or was lately current in the books put into the hands of our pupils, and is taught by certain recent German writers, made popular here by British patronage and translations, and this in spite of the notorious fact that those works, though often possessing great merit in other respects, are, as regards some of the most important points of physiological history and the fair fame of several of our best observers, really worse than useless.

So far from a cell being the "primary, simplest, or most elementary form," either animal or vegetable, it is certain that, passing by the state of solution in which organic matter exists in fluid fibrin, there are in it, and in other fluids or soft matters, under certain conditions, numberless molecules concerning which we have been for years insisting that they must be intimately if not fundamentally connected with growth and nutrition; while fibres may be unquestionably earlier and more simple forms than cells. In fact, nearly a quarter of a century has elapsed since it was proved that the formation of the fibrils in fibrin * is such an immediate result of its coagulation, as to be utterly irreconcilable with the cell-theory. At that time, and for years afterwards, this objection to the catholic doctrine was either quite disregarded or deemed heretical; but every successive addition to our knowledge has only tended to confirm the conclusion, that primordial fibres are often formed before and quite independently of the immediate agency of any cells whatever. And what (so long since displayed also in this

* Gulliver's App. to Gerber's Anatomy, figs. 244-7; Lond. and Edin. Phil. Mag. for Sept. 1842.

country*) are the minute, equal-sized, or primary molecules composing the molecular base of animal chyle and vegetable latex, or the larger unequal-sized or secondary molecules in the same fluids, in the juice of the thymus and lymphatic glands, in the blood of young animals during the height of digestion, in the suprarenal glands, and in the semen just before its perfection? What are the like molecules in formative, germinal, or histogenetic matter †, at the growing-point, throughout organized nature? What are the globules of milk? All certainly examples of organic matter in a more simple or elementary form than that of cells. Indeed an eminent zoologist, of whose system the cell-doctrine forms the foundation, has actually elevated such molecules, especially the globules of milk, to the rank of independent animals, and instituted for their reception his order Endocystica ‡.

To return to the clot of fibrin. This is commonly without regular form, a mere shapeless lump or plate. But its intimate structure is a net of fibrils; and even its mass may assume all the characters of a body remarkably regular and perfect, varying in size from a mere globule or vesicle to a bag as big as a football, according to the quantity of fluid set aside to coagulate. In the fluid from a blister, and in a mixture of two varieties of serum, a coagulum may form spontaneously at the temperature of the air, and present the characters of a closed membranous sac of great delicacy, with still more delicate processes running from its outside towards the centre, so as to make lacunæ there of the enclosed liquid; and in these experiments § microscopic analysis repeatedly proved that the intimate structure of this artificial membrane was generally composed of extremely fine fibrils with a sprinkling of minute molecules, though sometimes it appeared only faintly and delicately granular. Nothing like a cell, no corpuscle so large, or possessing its compound structure, could ever be detected throughout this primordial and beautiful membranous sac.

Well, then, here is a common animal form, really a typical one, a membranous shut sac with its internal lacunæ bounded by processes of the membrane, the whole possessing the intimate structure of fibrin, and, above all, produced by the simple act of coagulation, utterly without the immediate agency of cells or of anything explicable by or involved in the cell-doctrine. And

* App. to Gerber's Anat., figs. 274-8, 266-8; Lond. Med. Gazette, June, 1843-4, p. 411; Proc. Zool. Soc., July, 1842; Med. Times and Gaz., Aug. 23, Nov. 29, 1862, and Feb. 14, 1863, figures 7, 11, 17, 12.

† Beale's Lectures, 1861; Bennett's Lectures, in the Lancet, 1863.

‡ Grant's Tabular View of Zoology, 8vo., London, 1861.

§ Note xviii. to Hewson's Works; and 11th College Lecture, rep. in Med. Times and Gaz., Feb. 14th, 1863, fig. 13, in which Dr. Buchanan's discovery is cited.

now we have demonstrated that this typical form, so distinct and regular, may be originated and completed by mere coagulation in dead serum—not of the serum itself, but of a principle which fails to appear by spontaneous coagulation in a single or separate sample of that fluid, though soon made to do so by mixing two varieties of it together in a basin or bottle. In several of these experiments, coagulation occurred within a few hours (and sometimes in less than forty minutes) after the two varieties of serum had been mixed together, while the very same liquids remained fluid for many days when kept apart, and then never coagulated at all, but only became putrid, though they were all exposed alike in open jars. Hence the appearance of the fibrin was not due merely to the action of atmospheric air, and the views of Polli and Virchow concerning bradyfibrin or a fibrinogenous substance fail altogether to explain the phenomenon. How then can we doubt that the same mysterious force or relation under which this structure is generated may be in operation in the living body, so as to be capable of producing similar forms there, quite independently of cell-development, consequently by a far more sublime and simple process than that propounded by the German professors, and yet in accordance with the old and beautiful doctrine of Hunter? What, too, in a form thus constituted, is to prevent, under what he called "the stimulus of necessity, or the impression made on it by the surrounding parts," the addition to this structure of blood-vessels and so forth, or its otherwise remaining throughout its existence an extravascular part? Surely the facts of this little experiment, viewed in the light of comprehensive truth, are immensely more favourable to the validity of Hunter's tenets than to that doctrine by which they were supposed to be supplanted and destroyed.

When one cause is known and sufficient, why seek another for a fundamental process? Of two causes, the simpler, *cæteris paribus*, is preferable. Hunter always called the plastic fibrin coagulable or coagulating lymph, after Senac and Martin Butt. And what is the animal protoplasm, plasma, blastema or cytoblastema of the Germans but the coagulable lymph of Hunter? He observed that when it is effused from the blood-vessels, either in disease or for reparation of injuries, it may become more or less altered and assimilated to the parts which produce it, and that it is common to all animals, as well as capable of undergoing such changes as may be necessary for the growth and preservation of the species, being thus the most essential part of the blood. When he insisted on its power of forming vessels in and by itself, like the membranes of the chick*, there only wanted the further views of the process given by Schwann

* Hunter's Works, edited by Palmer, iii. 37, 119.

and his disciples. To these delightful prospects might Hunter have been led, using the microscope so well as he did in his experiments on suppuration, had he not indulged in such an unfortunate disregard for and strange ignorance of the import of Hewson's observations on the formation and structure of the blood-cell; for then cell-genesis, with more or less of the legitimate results thereof, could hardly have escaped his detection.

Now we hope sufficient has been said to show the relative merits of Harvey and Hunter as to the doctrine of the life of the blood, and that it must be a vulgar error to suppose that Hunter only left this momentous subject as he found it. So true and noble were Harvey's expressions concerning this question, that they have always appeared to me more like a solemn hymn to the dignity of that fluid, and a fitting tribute to the declaration of the inspired writer of the Pentateuch, than a mere physiological dissertation; but they were confined notwithstanding entirely to the life of the compound blood, whereas it was the great merit of Hunter to advance so much further as to furnish the complement to Harvey's doctrine, by a new flood of light on the special vital endowments of a particular part of the blood—the fibrin. Thus the discoveries of these two great men in this department, so far from being either identical or at variance, are true and independent illustrations of the same important inquiry. The eminent and ingenuous Schwann, in his turn commencing from Hunter's observations, as Hunter had done from Harvey's, made another signal progress, by an exposition of those intimate processes of organization which were before unknown. Still, though this also was a noble discovery, it cannot be exact, so far as it not only fails to comprehend, but actually rejects, a most interesting part of the true one of Hunter. We shall soon see how Hewson, on a different constituent of the blood, was above his distinguished contemporary.

It is not pretended on this occasion to have given an exposition of the cell-doctrine, which would have to be studied for that purpose by the lights of such eminent observers as Goodsir, Huxley, Savory, and Bennett. We have merely attempted to examine those points of it which concern some of the fundamental principles of Hunter. Of the great amount of truth comprised in that system of Schleiden, Schwann, and Valentin, and the gratitude due to its authors, no physiologist entertains a doubt, in spite of such errors as we have incidentally suggested, and the equally important objections in Mr. Savory's excellent Lecture.

But it is hoped that we have now adduced sufficient evidence to prove that the Hunterian doctrine in question stands yet in all the majestic simplicity of truth, really unaffected by the more complex tenets of the illustrious German histologists—in

fine, that even this single scene in the great drama, this little episode in the grand epic of Hunter's labours, would be alone sufficient to show the depth of his genius, to entitle him to the admiration and gratitude of posterity, and to the place of honour in philosophical surgery.

Hunter yet lives in the hearts of his disciples; and these, even now, after following his bones from their first resting-place to our venerable Abbey, are erecting his statue, a marble testimony of their respect, amid the deeds he loved so well. But all the shows of art, pictured pomp or sculpture, "speak in feeble imagery their own cold powers," needless, frail, and vain for his renown. His best eulogy, as of other great men, is to be found in his Works, especially in his Museum; and there, verily,

> "He in our wonder and astonishment
> Hath built himself a live-long monument.
> And so sepulcher'd in such pomp doth lie,
> That kings for such a tomb should wish to die."*

And here we might have concluded, but that, since you were last addressed on this anniversary of Hunter's birth, death has been so busy among us as to number among his victims such worthy disciples of the great physiologist—*haud passibus æquis*—as Quekett, Norman, Stanley, and Brodie; to whom a passing tribute must be paid, though we have no time for a critical examination of their respective merits, much less to anticipate the work of the biographer. The three latter died full of years, and in the enjoyment of that which the greatest secular judge of human nature tells us "should acompany old age, as honour, love, obedience, troops of friends."

But Professor Quekett was early lost to science, and not without leaving beautiful marks of his course behind him. He was one of the first, if not the very first, deceased in this country, of those eminent men who devoted their talents exclusively to the abstract and higher branches of our profession, quite regardless in this noble pursuit of the meaner considerations of practice and profit. His researches, small or insignificant as they might appear to some minds, are really large and important; and the remark that has been often repeated of late, to the effect that his observations were only of a fragmentary or isolated character, deficient in connexion, I believe to be unjust to his memory. He widely explored the field of histology. His inquiries not only extended through the animal and vegetable kingdoms, but also to mineral substances; while his collected specimens of intimate structure of organic nature surpassed in number and value anything of the kind before displayed in Britain. And these, which he had indeed found and collected

* Milton's 'Epitaph on the admirable dramaticke Poet W. Shakespeare.'

as mere loose facts, with little more affinity than the order of words in a dictionary, he soon reduced by their relations to arrangement and method, of which only a mind diligent and comprehensive could have been capable, as is well attested by his published Lectures, and by several volumes of the Descriptive Catalogue of our Museum, more especially by the Histological Series. Such a mind could not be thus employed without discovering central or comprehensive truths, could not be confined to mere fragmentary, subordinate, or minor facts*. Accordingly, among other fundamental or leading phenomena, his early observations on the nature and arrangement of capillaries led him soon to exhibit, in the blood-vessels alone, grounds for a rational hypothesis of the significance and use of the air-bladder in fishes. His original researches, two or three years afterwards, on the intimate structure of bone were of still higher import; for they at once and for ever demonstrated the analogies and differences of this structure, and with such admirable precision and clearness as not only to indicate the essential characters in this respect of the vertebrate sub-kingdom, but also the means of determining the affinities and contrasts of minute fragments of the organic remains of a former world. So no wonder that, when results of such importance afterwards appeared in Continental publications pretending also to display the literature of the subject, but without the least reference to or acknowledgment of his observations, the notion should have occurred that they had been "conveyed," as Ancient Pistol would say; though we cannot but feel surprised when we find this too frequent practice, this sorry desertion of truth and of the just claims of British science, silently acquiesced in, if not approved, adopted, and patronized, by some one or other of our Societies, translators, commentators, or eminent teachers. But, as Mr. Quekett more than once emphatically remarked to me, he suffered this indignity in very worthy company. And it may be added, as I have said elsewhere, that the fair fame of our illustrious countrymen should be accepted by us as a sacred legacy and trust, to be cherished while our science lasts; I will hope, too, that generous hearts will not be wanting among us to defend Hewson and Quekett on the proud pedestals which they have so honourably gained.

Though Mr. Quekett, like Pope, might truly have complained of that long disease, his life, he retained to the last his wonted serenity and affability, kindness and humility; while his constitutional sweetness of temper was neither affected by the

* His observations on Raphides were early and imperfect; but these I have so far extended and reduced to order as to show their value as botanical characters. See several numbers of Ann. Nat. Hist. for 1863, Prof. Beale's "How to Work with the Microscope," 5th edition, plates xlvii. and xlviii., and the Roy. Society's Cat. Scientific Papers.

plagiarism of his labours abroad, nor even by the pitiful attempts of anonymous defamation at home. He was one

> . . . . . "so spotless in deed,
> So pure in thought, both without spleen and gall,
> That never injured creature, never had heart
> To think of wrong, or ponder injury."*

In truth, it was Mr. Quekett's happiness to have his mind so full of the importance of those pursuits which he loved so well and truly, as to leave no room in it for the nurture of lower feelings. His gentle nature could not entertain what our great epic poet calls "the troubled sea of noises and hoarse disputes,"† but preferred in a calm and pleasant retirement to enjoy the still air of his delightful studies. He was not, like honest Izaak Walton's poor rich man, condemned to riches and then to a busy discontent; but enjoyed in his meekness, as promised by our Lord and the Psalmist, a far richer and better possession, and so had truly found the ways of pleasantness and the paths of peace. And if thus happy in the common routine of his life, "in populous city pent," how would his heart leap up when he escaped from that confinement for a short country recreation (such as angling, which he loved), and with joy and gratitude did then behold the outward forms and shows of rural nature,—

> "Well pleased with delights that present were,
> Fair seasons, budding sprays, sweet-smelling flowers."‡

Such were some of the ruling traits of this meek and good disciple of Hunter.

Mr. Norman was a man of a different stamp. He early marked out the best course by which to arrive at the goal for which he panted, and won it in a manner alike honourable to himself and to the profession. When we remember that he was Deputy Lieutenant of the County, and twice chief Magistrate of the city of Bath, we may be sure that he did not, like Mr. Quekett, entirely eschew politics and confine himself to the soft abstractions of science in the gloomy shades of collegiate bowers. This would not have suited Mr. Norman's genius, which was more allied to that practical form which has been said to be at once the pride and dominant character of the English mind. He pursued the paths of professional practice accordingly with admirable tact, sagacity, and self-reliance, and a kindly manner which won confidence and friendship. His abilities had been early recognized in a generous spirit by the late Dr. Parry, to whose patronage much of his early success was pro-

* Helena, in the Challenge for Beauty: a Tragic Comedy, by Thomas Heywood, 1636.

† Milton's Preface to his Second Book of Church Government.

‡ Drummond of Hawthornden.

bably owing—as I learn, among other particulars, through the courtesy of Mr. Hodgson and Mr. Soden, as well as that the venerable physician was glad to avail himself of the assistance of the young surgeon in those experiments on the arteries which have made the name of Parry familiar to physiologists. But Norman's success was really achieved by that excellence of judgment and skill in operative resource which entitles him to rank as one of the most eminent of the many provincial surgeons who have reflected honour on this College. Remembering his accurate diagnoses in cases involving the arteries, and how admirably he succeeded in taking up those vessels, even when great and unexpected difficulties had arisen in the course of the operation, we must concede to him an excellence in this important branch of surgery, and, to do him full justice, should consider the time when he was thus successful, only a few years then having elapsed since such an eminent authority as Richerand was declaring that "Mons. Abernethy prétend avoir lié l'artère iliaque externe." In the year 1825 Norman successfully tied that artery and followed Dr. Mott in fixing a ligature around the arteria innominata. Norman had tied the common carotid two years earlier. But his chief operation of this kind was a demonstration of the practicability and prudence of securing both the lingual arteries in a case where excision of the tongue had become necessary. This, too, was in 1825, as I gather, through the kindness of Mr. Hodgson, from a short and excellent MS. paper by Mr. Norman, read at a meeting of the Medico-Chirurgical Society, though not published in the Transactions of that learned body. To each young member of our profession who may have set his heart on the honours and emoluments of surgical practice, we may point to the conduct and career of Norman, and say, "Go, and do thou likewise."

Whether Mr. Stanley can be regarded as such an example is doubtful, since I know not that his success in this way was equal to his deserts. He was chiefly distinguished in surgical anatomy and pathology, and, though destitute of those graces of style with which his eminent master Mr. Abernethy was wont to adorn his instructions, was really one of the best and most successful teachers of his time, and a great expounder of what he loved to call practical anatomy. Those who, like myself, have had the advantage of his demonstrations must have felt that few lecturers ever possessed, and exercised so well, the power of transferring knowledge to pupils. It was impossible, for instance, to attend his demonstrations, at St. Bartholomew's, of the parts concerned in the different forms of hernia, without at once perceiving that remarkable perspicuity by which this branch of anatomy was then and there reduced to the level of the meanest capacity; and it would be difficult to overrate the amount of the best practical skill of this and kindred subjects

which he was thus the means of diffusing throughout the country. Those demonstrations were so highly esteemed, that at them we used to be overwhelmed by students from other schools---more especially from the Borough, even during the brilliant reign there of Mr. Green and Sir Astley Cooper. But it would be unjust to the memory of Mr. Stanley, to limit his merit to this ground. He was the author of numerous papers in the Transactions of the Medico-Chirurgical Society, and of several independent works---all examples rather of a vigorous understanding and perspicacity than of the creative faculty, happy reductions of his great experience and exact knowledge of anatomy to the practical service of our profession, and, in short, excellent contributions to surgical pathology.

Sir Benjamin Brodie was the last survivor of a great race; that is to say, of those eminent physiologists who were the glory of the school in Great Windmill Street, and of British physiology, at the end of the last and early part of the present century. In that remarkable school were delivered the first complete courses of Lectures, with adequate illustrations, in England; and there, by a splendid series of physiological researches, Mr. Brodie commenced that career which was thenceforth one unclouded blaze of light, shining during the greater part of his long life on the principles and practice of surgery, and illustrating at its close the difficulties of psychological science. His success was such as might have been expected; and he was really one of the few men who have shed a lustre on our profession by the rare combination of a good preliminary education, elevated mental talents, decision of character, singular tact and perspicacity, ample wealth in every sense, and a social position as exalted as the endowments by which he had won it. But though we regard his meridian and setting effulgence with so much respect, it is to its rising that posterity may look with more admiration, while the future historian of physiology in England may sigh that such a mind was ever diverted from those higher pursuits by the distractions of professional practice, —yet not without the consoling reflection of how much human misery was thus immediately alleviated, and that Brodie touched no subject without adorning it, engaged in no branch of science without extending its bounds and strengthening its foundations. Accordingly, his works on the Diseases of Joints and on the Urinary Organs had an important influence in this respect; and his last book, 'Psychological Inquiries,' affords abundant marks of his active and potent abilities. Still we revert with more interest to his earlier labours, and cannot avoid delighting in the skill and fertility of experimental resource, and sagacity of observation, by which, in accordance with the prior belief of Hunter, he demonstrated the insufficiency of the alluring and then universal hypothesis of Lavoisier, Laplace, and Black, concerning the gene-

ration of all the animal heat in the lungs. However, I have elsewhere* shown how Brodie's tenets, and those which truly attribute that heat to chemical processes throughout the body as well as in the lungs, may be regarded as results of two independent sets of observations which mutually illustrate each other, and this by that beautiful harmony of contrast which Coleridge has so admirably described. In lamenting the loss of Sir Benjamin Brodie we are feelingly reminded how fast remorseless time is depriving us of the great masters of the old Physiology, of the school of Harvey, Haller, and the Hunters, and of such of their disciples as Abernethy and Cooper, men who observed so well and truly the broad and most useful facts of the science in relation to the practice of our profession—and this without the aid of the present more advanced state of animal chemistry, and of the improved optical instruments which have created, or at least given its present eminent position to, the new histology. But we must not forget the eminent services, without such advantages, rendered by Hunter and Hewson in England, and by Malpighi, Andrew Bonn, and Bichat on the Continent, nor the danger of cultivating the new branches to the neglect of the old trunk.

Neither can we take leave of this last of the very great teachers of the Windmill Street School (where flourished also the Hunters Cruickshank, Wilson, Baillie, Sheldon, Charles Bell, and other illustrious men) without some tribute to the genius of Hewson, who first succeeded Mr. Hunter as assistant to Dr. Hunter in that admirable theatre of anatomy and physiology. This respect to the memory of Mr. Hewson is the more necessary, not only because he has had scanty justice in this place†, where his merits were almost as unworthily appreciated in the oration by Sir Benjamin Brodie as they had before been in the writings of Mr. Hunter, but that it is at once a duty and a pleasure, in the cause of truth, to vindicate the fair fame of an eminent English physiologist, and to defend that fame from the modern Germanic aggression to which it has been so ungenerously subjected—in short, to claim and execute the trust of his reputation in behalf of the British School of Physiology.

Hewson had reached so far into an undiscovered region of histology as to be quite beyond the knowledge of his time and the comprehension of his contemporaries and immediate successors. None of them, not even the Hunters, Cruickshank, or Sheldon, could share his conviction that "the red particles of the blood are conveyed to the different parts of the body to

* College Lecture ix., reported in the "Medical Times and Gazette," Jan. 17, 1863.

† Though I find that Mr. Grainger, in the Oration of 1848, has given an excellent notice of Hewson's "beautiful and masterly series of experiments on the endosmotic processes in the red corpuscles of the blood," and of his position in regard to "the discovery of the nucleated cell."

answer the purposes of nutrition and vivification, and that the thymus is necessary to perform an office in the early part of life depending upon respiration "* ; none of those eminent men or their disciples cared for his proofs that this gland is an appendage to the lymphatic system for the formation of central particles or nuclei when these are most needed for sanguification. Much less could they understand or realize his equally new and beautiful exposition of the development, structure, and diosmotic force of a cell. Here he was a lone star in a dark firmament. And having been thus, as far as regards the limited circle of his researches, a man above his age, he for that very reason requires to be judged in the light of a later generation. But it is pleasant to note that there was at least one exception to that dreary neglect, one physiologist who had immediately followed those researches, and "frequently repeated all the experiments since Mr. Hewson's death." It was the ingenuous youth Magnus Falconer who thus saw and believed the wonders he had been taught by his master and brother-in-law, and paid such a noble respect to his memory in the publication of the last part of his 'Experimental Inquiries.' And yet Mr. Hunter, sixteen years after the appearance of that volume, not only discredited some of the best observations therein on the red corpuscles, but declared that "the circumstance of the red part of the blood having form probably led anatomists to pay more attention to it than it deserves, as if they could thence explain any essential principle in the blood or animal economy"†. Nevertheless there was Hewson, at least twenty years before the death of Hunter, not only correcting the injurious errors of Leeuwenhoek and his school, and propounding or establishing instead great truths about the blood-corpuscles, but fairly entering that prolific field of cells and endosmosis which was left utterly forgotten and barren for upwards of half a century afterwards, until new minds, with the aid of better instruments, found in it such a variety of rich fruits, and confirmed so many of his long-neglected conclusions, as to reap the harvest of his labours.

Hewson's observations on the lymphatic glands, thymus, and spleen are so valuable that they still form the best foundation for future research concerning the recondite office of those organs, as well as part and parcel of some of the most recent tenets of our day, and a depository of facts and theories which, if not better known on the Continent than here, have certainly been translated thence into our own language, and patronized by his own countrymen as recent and original foreign discoveries —all this, too, not only without any honest mention of his name, but with that contempt for the just claims of Hewson and

* Hewson's Works, Syd. Soc. ed., pp. 282, 263.

† Hunter's Works, edited by Palmer, iii. 59.

British science which such ignoble treatment of the fruits of his labours would imply*. When he undertook the inquiry relating to the lymphatic glands, nothing whatever had been done to a like effect on the subject; and it was despised or forgotten for years afterwards,—though we must now perceive how new and true most of his observations and experiments were, and that such a masterly exposition of the phenomena with the imperfect instruments at his command (the best of which was a simple lens of $\frac{1}{23}$rd of an inch focal length), and amid the prevailing darkness of the time, presents one of the most remarkable achievements of physiological science—and this not as a result of one of those happy chances by which some as great or greater discoveries may have been suddenly made, but as a logical sequence of an extended series of experiments and observations, clearly and wisely devised, and patiently and skilfully executed during the course of several years of his too short life; so that, considering also his labours concerning the mature red corpuscles, he must be regarded as the great founder of this branch of histology.

However little those inquiries were comprehended at the time, his merits on other subjects were recognized during his life. In 1770 the Copley medal was awarded to him by the Royal Society for his highly interesting investigation and demonstration of the lymphatic vessels of oviparous or pyrenæmatous†

* Thus, in spite of Dr. Hughes Bennett's judicious assertion of the undoubted right of our countryman, Professor Virchow actually claims for himself, in connexion with his so-called Leukæmia, and with the silent approval of his English editor, Hewson's discovery of the office of the lymphatic glands. And so we need not be surprised at the same professor's pretensions to the discovery of Thrombosis and Leucocythæmia nor at any assistance he may have had in such courses from his friend Professor Kölliker, seeing that this Professor also treats Hewson and Quekett with similar contempt, though it is surprising that he should have been permitted to do so under even more remarkable British patronage. Far more potent agency, however, would be required to wash Hewson's name out of the page of physiological history; "merses profundo, pulchrior evenit." See Virchow's Cellular Pathology; Kölliker's Microscopic Anatomy; Med. Times and Gaz., Feb. 28, 1863, p. 208; Bennett's Leucocythæmia, p. 99; and Davy's Army Diseases, p. 267.

† According to my observations, the presence or absence of a nucleus in the regular or mature red corpuscle of the blood is really the most single, universal, fundamental, and characteristic difference between oviparous and mammalian vertebrates, hence denominated by me, Pyrenæmata and Apyrenæmata, from πυρὴν nucleus, αἷμα sanguis. Whatever may have been the genesis of that corpuscle in Mammalia, and notwithstanding I have long since proved that some of their red corpuscles may be nuclei of much larger pale cells, in its free, whole, and perfect state it is no longer a nucleus or anything like one, nor a cell, but a peculiar body without any known homologue. See Phil. Mag. for Sept., 1842, p. 170, fig. 2; and College Lectures, rep. in Med. Times and Gaz., 1862-3, figures 1 and 8.

vertebrates; and on that occasion the adjudication was declared by the President to have been made in favour of Mr. Hewson for the best contribution to the advancement of science and useful knowledge during the past year. And when we add to his other deserts his complete demonstration of the distinctive characters of the three proximate constituents of the blood, which were set forth by him so clearly and peremptorily as to give us in this country the enjoyment and profit of those fundamental facts ever since 1770, we must also bear in mind how much such knowledge was needed, for then and upwards of sixty years afterwards such a general ignorance prevailed on the subject throughout the Continent that Professor Johannes Müller, even so late as 1832, had to remove the darkness there by a supposed new discovery which was no more than a needless confirmation of Hewson's proofs. So we may well feel what a debt of gratitude we owe to our young and illustrious countryman. Considering, therefore the novelty, accuracy, number and weight of his inquiries concerning the blood, we must be led to the verdict that he transcended both Mr. Hunter and all his other predecessors and contemporaries, in every part of Europe, in this important and central branch of physiology.*

Finally, Mr. President and Gentlemen, if I have rather forcibly submitted to you some of the just claims of the British School of Physiology, in the labours of John Hunter and his disciples, it has been done conscientiously in the defence of truth—I hope, temperately and neither lightly nor inconsiderately, and yet with sufficient decision and accuracy to assert if not maintain her sacred cause. Let us never forget that we belong to the country of Harvey and the Hunters, nor, when we deplore the loss of such of their followers as Brodie, Norman, Quekett, and Stanley, cease to feel that excellent consolation which is afforded by the character of their lives and the example they also have left to us and to our posterity; for

"These were honourable men in their generations."†

* When I was a pupil the name of Mr. Hewson was seldom or never mentioned in the great metropolitan schools, so much had it been eclipsed in England by the authority of Mr. Hunter. More recently, an eminent teacher, in his Lectures, as well as by an early correction of Professor Müller's mistake concerning the history of the revival of a knowledge of the agency of the fibrin in the coagulation of the blood, has wisely appreciated the merits of Hewson. And Professor Sharpey's respect for British physiological science did not end there; for to him also, with the generous support of Dr. Babington and the late Dr. Clendinning, was chiefly owing the success of my proposal for the reprinting of the Works of Hewson by the Sydenham Society. In France the high value of Hewson's Works has been gracefully acknowledged by the venerable and distinguished Professor Milne-Edwards, in the first volume of his "Lecons sur La Physiologie et L'Anatomie Comparée," 8vo., Paris, 1857.

† Ecclus. xliv., 7.