**The Hunterian Oration, delivered before the Royal College of Surgeons ... 1849 / [Caesar Henry Hawkins].**

### Contributors

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Dr Marshall Hall

With the Author's Compts

# HUNTERIAN ORATION.

# THE

# HUNTERIAN ORATION,

DELIVERED BEFORE THE

ROYAL COLLEGE OF SURGEONS OF ENGLAND,

ON THE 14TH OF FEBRUARY, 1849.

BY

CÆSAR H. HAWKINS,

SURGEON TO ST. GEORGE'S HOSPITAL.


LONDON:
JOHN CHURCHILL, PRINCES STREET, SOHO.
MDCCCXLIX.

NOTE.—In order to confine the oration strictly within the allotted hour, two or three paragraphs were omitted in the delivery, but have been allowed to remain unaltered in their respective places in the printed copy.—C. H. H.

LONDON:
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# HUNTERIAN ORATION.

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MAY IT PLEASE YOUR ROYAL HIGHNESS,*
Mr. President, and Gentlemen;

"As a lasting mark of respect to the memory of the late Mr John Hunter," this day, the anniversary of his birth, has been set apart for this meeting by his relatives, Sir E. Home, and Dr. Baillie. But of one born in the year 1728, and removed from this scene of his labours fifty-six years ago, and made the subject of comment almost annually for the last thirty-five years, —what can possibly be said in elucidation of his character, and of the value of his scientific investigations, which has not been already rendered familiar to almost every one in this assembly?

None will refuse to recognise in Hunter's unrivalled museum an evidence of unwearied pursuit of knowledge, and of stupendous labour, almost incredible as the work of one man in the short space of thirty-five years: —few will hesitate to believe, on the concurrent testimony of all who are best qualified to judge by their own eminence in the same pursuits, that in the sciences of anatomy and physiology,—human and comparative,

* H. R. H. The Prince Albert honoured the College by his presence on this occasion.

—he effected a kind of revolution, and first pointed out the true path by which alone the mysteries of organised beings in every department, vegetable and animal, can be unravelled:—no one who has sufficiently studied his works and mental powers, will refuse to Hunter a place among those bright luminaries of science, from whom, as from the more distant heavenly bodies, light may still continue to reach us, even for centuries after they have themselves become extinct.

And thus, even with reference to these sciences, the last few years have added much to our knowledge of his real merits:—the publication for the first time, in 1835, of a collected edition of his works, in which his opinions are ably illustrated by the comments of the persons most competent each in his respective path;—and the republication within these ten years of the physiological catalogue of the museum, with much labour and zeal for his character, on the part of our distinguished Conservators;—together with the able remarks of some of those whom I this day follow,—haud passibus æquis,—have demonstrated how vast and varied a fund of original knowledge was actually possessed by him, in many points unsuspected, till brought to light by kindred minds, and explained by the advance of science since his time, and have shown that few men ever lived who could have declared with so much truth in so extensive a field,—

"Libera per vacuum posui vestigia princeps,
Non aliena meo pressi pede." *

* Hor. Ep. lib. i. 19.

And now, by the joint labours of yourself, Mr. President, and of our junior professor, Mr. Paget, within the last three years, the catalogue of the pathological department of the museum has also been almost completed; —illustrated in the same spirit as the physiological, by extracts from Hunter's unpublished, as well as from his before known pathological writings; and calculated by the arrangement of the collection, to give to the latter an increased interest, by showing the very preparations he was accustomed to employ, when conveying instruction to his pupils by their means.

Hitherto the pathological department of the museum has not perhaps harmonised in importance and utility with the rest of the collection, though its merits were not unappreciated by a few select students: at present, however, by numerous purchases on the part of the College, in the last few years, at an expense of nearly £4,000, and by donations from its Members, (far less numerous indeed than they will be hereafter, now that their utility is so much enhanced by classification and display,) the collection has become doubled in numbers and value, since the first brief catalogue in 1830, and may claim at least comparison with any other museum of this branch of science, if indeed it may not already boast of the same undisputed superiority, which the physiological department possesses; and now by examination of Hunter's own preparations, explained in his own words, may be seen more clearly than before, how close was his attention to diseased function and structure, as well as to the natural condition of all organised beings.

And now also we are in a better position for answering the question which has often been proposed,—granting his great eminence as an anatomist and physiologist, what has Mr. Hunter directly effected, as to the knowledge or the treatment of disease, that surgeons always express for him so much admiration?

If even in this assembly there are some laborious surgeons, whose candid confession would be an acknowledgment that they had never studied the one greatest and most finished of his works, it is the same also with all writings which are profound and full of research;—which require much knowledge, and much application of mind in the reader also, to understand the conceptions of the teacher, engaged in following out his subject in every possible point of view; and which perhaps excite some alarm at the apparent vastness of the labour in prospect, as when Hunter apologizes thus:—"I shall be a little abstruse in the present lecture, which I intend as an introduction to all animal matter."* Of such writings it must ever be, as was said by Bichat of the chief surgical works in Hunter's time, "One hundred pens retrace every day what fifty have borrowed before them from twenty others, themselves only copyists."†

Neither would a fair inference be drawn as to Hunter's influence on surgery, if it could be shown that

* Works, vol. i. p. 211.

† "Cent plumes retracent chaque jour ce que cinquante avoient emprunté avant elles, de vingt autres elles-mêmes copistes."—*Œuvres Chirurgicales de Dessault*, T. 1, vi.

some of his cotemporaries are more often quoted even now than he is, in reference to practical surgery, and that they are even safer guides in some points of treatment; as, for example, when Hunter postponed an inevitable amputation to a remote period after an accident.

It would be easy, on the other hand, to enumerate many facts, which were well known to him, of much interest and importance in the practice of surgery, but which were forgotten and overlooked till again discovered by other observers, after the lapse of considerable time, and at once, with all the force of novelty, indelibly fixed among the settled maxims of practice.

But it is not in such examples of correct observation in individual pathological or practical points that Hunter's merits lie, nor is it for them that all students in the science, rather than in the mere art of surgery, regard him as their great master.

The estimate of posterity has accorded with that which Mr. Abernethy mentions as the opinion given to him by Hunter himself of his own capacity, when irritated by the neglect or plagiarisms of some of his cotemporaries:—"I know I am but a pigmy in knowledge, yet I feel as a giant when compared with these men." *

Notwithstanding their great practical merits, we look in vain, even in Bichat's eloquent description of Dessault's surgical improvements, as we do also in the writings of Pott, (each at the head of surgery in their respective countries in Hunter's time,) for that con-

* Abernethy's Physiological Lectures, p. 199.

stant reference to every part of anatomy and physiology, so conspicuous in Hunter, for that depth of thought and varied illustration which fix the attention and necessitate the exercise of the mind of the reader, in dwelling on the doubts and suspicions,—the half-formed theories and hypotheses,—so thickly scattered through his writings;—many of which have been proved by further investigation, with increased collateral knowledge, to have been most sagacious anticipations of important facts.

Leaving to others the application of details, Hunter's constant aim, as he informs his pupils, was "to explain to them the principles of the art" of surgery;* and thus, by reasoning, and comparison, and analogy, to render them fit to cope with unusual and unforeseen difficulties;—it was by enforcing these guiding principles, in a spirit of experimental research, that he contributed to effect a great and permanent change in surgery, pathological and practical, no less influential than that which he produced in physiology;—a change which is still felt unconsciously by every one who enters our profession, because silently actuating most of his immediate instructors.

Hunter himself complained, "Since I have lectured I have scarcely found a pamphlet without some of my opinions, and often my very language:"† and it is in fact the truth. Some of his immediate successors, thoroughly imbued with his spirit, successfully cultivated the science of surgery, and they have been the teachers of their profession; to Hunter's influence on

* Works, vol. i. 208. † Ib. p. 210.

their precepts, among many causes, are we, I doubt not, largely indebted for that impulse which has been given to surgery among us in the present century.

Nor is this spirit extinct among the members of this College; but I am precluded by the founders of this meeting from dwelling on the labours of many eminent followers of Hunter, because they still move within our observation.

It is my duty, however, to recall to the recollection of my audience the loss sustained by the Council, of whom no less than three "are deceased" since the last anniversary.

Two of these, Mr. Briggs, and Mr. Callaway, afforded a remarkable contrast, physical and mental; —the latter, the active practical man, laboriously occupied in applying his skill for the benefit of a wide circle, by whom his kindness and open manners were extensively appreciated,—the former, the shy, and modest, and retiring student, whose worth was known in a comparatively narrow sphere. Both held several public appointments, but by neither of them was the literature of the profession materially increased; Mr. Callaway, I believe, never published any paper connected with surgery: Mr. Briggs translated Scarpa's work on Aneurysm, a subject which this Italian pupil of Hunter prosecuted with much ardour, derived, no doubt, from personal interest in the philosophical proposal of his great master for its cure.

Appreciating as I do, however, the zeal evinced a

few years ago, by the Council of this College, for the cultivation of literature among its Members, I venture to add that the Library then founded, and since increased at an expense altogether of above £14,000, was a subject in which Mr. Briggs took a very warm interest, and contributed not a little to its efficiency and usefulness.

The Library of the College now contains nearly 23,000 volumes, and is the most complete in the kingdom in every department of science relating to medicine; and although the possession of 2,500 volumes on natural history shows that its character is not solely medical, yet considering its purely scientific nature, the fact that the names of 5,808 visitors are recorded as having availed themselves of its advantages in the last year, demonstrates the justness of the opinion formed by the Council of the literary and scientific pursuits of its members, when such an opportunity as they here enjoy was afforded to them.

The third loss which the Council has sustained is that of Mr. Samuel Cooper, whose surgical erudition has earned for him a wide reputation. Educated at Dr. Burney's, he began his professional studies exactly half a century ago at St. Bartholomew's Hospital, to which institution he ever retained a warm attachment. Although staff-surgeon in the army, his public services, I believe, were confined to a brief period before the short peace of Amiens, and again after that great victory, by which was purchased the longest peace that Europe has ever known.

Mr. Cooper occupied several high situations, and was for the last seventeen years surgeon to University College Hospital, where his great surgical knowledge, and his kindness and urbanity of manners in the duties of Professor of surgery, procured for him the warm attachment of the students. He was also for many years an examiner of this College; and in 1845 he filled that highest office in its government which you, Mr. President, now occupy. While yet a young man he published a treatise on the diseases of the joints, which had gained the Jacksonian prize of the College; but his fame as a writer depends upon his great work the "Dictionary of Practical Surgery." Mr. Cooper himself remarks, "This book, imperfect as it is, has been a work of inconceivable labour;"* and in truth it presents an immense mass of surgical information culled from every valuable source, not only among the older writers, but also from the best French, Italian, German, and American authors. It has been translated into the three former languages, and republished by our Transatlantic brethren, although they at one time complained that he had not done full justice to their merits.

In this country seven large editions appeared previous to the year 1838. During most of the thirty years preceding that period it formed the text-book of every surgical student, generally in conjunction with his "First Lines of Surgery," a work which also passed through several large editions, and professed to give, in a more simple form, the recommendations of his own

* Preface to third edition.

experience. Both works are, however, already in great measure superseded by more modern manuals expressly adapted to the use of the inexperienced; because, although the Dictionary will long continue to be consulted by surgeons as a kind of Bibliotheca Chirurgica, (which its author himself regarded as one of its most valuable objects,) the very richness of its references embarrasses the younger student, from the absence of any guiding voice between them.

Indecision from consultation of too many authorities is not, however, the modern tendency; the change that literature in general has undergone, in the last quarter of a century, has necessarily been felt in our profession. Compendiums and journals usurp the place of the ponderous tomes of antiquity; and among us perhaps, as elsewhere, some may be found of whom it may be said, that they

> "Pick up their little knowledge from reviews,
> And lay out all their stock of faith on news;"*

the apparent extent of prospect, of which they thus acquire the survey, concealing from them its superficiality.

But, on the other hand, I trust that the impulse which in the same period the advancing tide of knowledge has received, has also reached us, and that by no means an inconsiderable number have become more studious and more scientific; and that in the same manner, as a great change was introduced by Mr. Hunter in the latter half of the last century, so within the last few years a change not less important has

* Churchill.

commenced, by which pathology and surgery will be as much advanced;—not now by the labours of a single individual, but by the concurrent efforts of a great number of zealous votaries of science; nor yet by precisely the same instruments, but in a similar spirit of experimental research and philosophical induction, over a still more widely extended field.

The great results which I anticipate in pathology and practice, both medical and surgical, are again to be derived in part from further researches into anatomy and physiology, by more minute and accurate examination of both the solid and fluid materials of animal and vegetable beings, and by having especial regard to that general anatomy of *tissues* which Bichat first raised into notice, but which is at present carried, by the aid of the microscope, and of organic and inorganic chemistry, to a far higher degree of refinement.

At one time some local point of anatomy is determined;—for example, that reflexion of the synovial membrane over the cartilage of joints, which this great physiologist saw only in imagination, is now proved, by tracing the epithelial cells, really to exist in the fœtus, though probably only in fœtal life. At another, some single point of surgery, as when it is shown that the rare union of the fractured neck of the thigh bone cannot possibly be effected by means of the vessels of the round ligament, as was suggested by Sir Astley Cooper, because those vessels are reflected at their looped extremities, without entering the bone at all.

But it is in minuter and more general subjects that

modern physiology and pathology are chiefly employed, and now promise to unravel and simplify some of the mysteries, and to explain in a different and more intelligible manner many of the functions of life,—digestion, respiration, secretion and excretion, nutrition and reparation, are all presented to our inspection in a novel form, which gives fresh charms to physiological science, and which is of the utmost importance to clear views of morbid changes of structure and function.

I. The discovery of nitrogenized or albuminous principles in all vegetables has at once removed much of the mystery of the animalization of nutriment, and by showing that the conversion of vegetable substances, free from nitrogen, into albuminous matter for the support of animal life, is not required to be effected in the stomach, the process of digestion becomes much more like simple solution and absorption.

Of little less importance towards our comprehension of the removal from the body of substances no longer required for its use, is the discovery of kreatine in the muscles, which constitute so large a part of all animal bodies, and out of which, as Liebig has shown, urea can be formed,—that subtle alkaloid poison, for the removal of which such constant and careful provision must be made in order to preserve life.

Above all, in interest, is our knowledge of the power of absorption of gases by the blood, and especially of the influence of oxygen in the chemical changes, and removal from the body of both its nitrogenous and non-nitrogenous elements: facts which have modified

the doctrines relating to respiration and the production of animal heat, and to nutrition and absorption.

"No chemist on earth," says Mr. Hunter, "can make out of the earth a piece of sugar, but a vegetable can do it."* The modern chemist, however, in his laboratory can effect transformations, little less wonderful, of one organic product into another. He can convert starch into dextrine or sugar, by adding a little alkali to some pancreatic fluid;† or he can change his sugar into fatty matter, or butyric acid, by causing it to ferment with putrefying caseine.‡

Does not then the physiologist, with infinitely greater clearness and certainty, comprehend how many similar chemical conversions can be effected in the living body, in health or in disease, subject as it is to perpetual changes from the action of oxygen on its solid and fluid materials?—conversions, the previous obscurity of which has been in some measure explained by Mülder's law of chemical tendency, that is to say, the necessity for the presentation, at the precise period of greatest affinity, of the substances to be acted on; just as some non-telluric bodies, arrested by the earth, become visible to us only at the instant of their destruction by ignition.

That every molecular change of nutrition or secretion—every action of a muscle,—the exercise of every mandate of the will through the nerves,—perhaps every

* Hunter's Works, vol. i. p. 217.

† Matteucci. Lectures by Pereira, p. 104.

‡ Liebig's Animal Chemistry, p. 113, third edition.

thought of the mind—is accompanied by some disturbance of chemical affinity, some disengagement of electricity, of heat, and occasionally even of light, are now facts familiar to every one.

And may not practice, on the other hand, be made much more effective,—sometimes by prevention of disease, in the important but much neglected field of the chemistry of diet, and other prophylactic measures? and at other times in the treatment of disease, by the use of remedies directed chemically, to the morbid chemical changes known to be in progress; whether in the first processes of reception of food and sanguification, or in the building up of the several textures of the body in nutrition by the new materials, or in the elimination of noxious and effete substances by respiration and excretion.

The subject of the removal from the body of the worn-out materials of the frame, and of substances introduced in excess, furnishes a very remarkable instance—shall I say of want of patriotism, and gratitude to one of the fathers of organic chemistry, or of the influence of a mere change of language on the imagination? There is no doubt that the oxydation of the tissues, in the words of the illustrious German chemist, is altogether included in the secondary assimilation of Dr. Prout; that the latter most fully pointed out the physiological processes subsequent to sanguification, "the formative and destructive changes" in the solids and fluids of the animal economy, with the greater part of what is yet understood of their im-

portant bearings on pathology, in reference to the several gelatinous, or albuminous, or oleaginous materials of the body, in the production of cutaneous diseases, of gangrenous inflammations, of calculous complaints, of gout and consumption, and many other disorders; and in many particulars, probably with greater accuracy than Liebig. *

It is, however, a common error to mistake fresh terms for new ideas, and merely altered explanations for real acquisition of knowledge.

II. In the second place, the discovery of cell formation, and of endosmose, and exosmose, *i. e.*, transudation and chemical separation through their walls, as affecting not only the primary cells, but every membranous part of an organic body, and even the globules of the blood itself, has materially changed our views of nutrition and of secretion and absorption, with reference to all the *fluids* of the body, and has made these processes appear like many similar changes effected in liquids by the same laws, out of the living body.

Thus in secretion, one cell selects its peculiar principles, and becomes filled with bile, another with saliva; but the active agent being in every instance a simple cell, it is no wonder that changes in the common liquid, within and without the cell, should affect the cellular endosmose, and that secretions should become, to a certain extent, vicarious; that the elements of bile, for example, should be separated by the cells

* See especially the Introduction to Dr. Prout's work on "Stomach and Urinary Diseases." 3rd Ed.

of the kidney, and of urine by those of the skin. Still more important is the recent discovery of one of the most peculiar products of one excretion, urea, even in the healthy fluids of the body; as in the aqueous humor of the eye, and of both urea and uric acid even in the blood itself, without the intervention of any secreting organ; a circumstance so improbable in the history of secretion, that although, as he informs us, urea was thus seen by Dr. Prout in 1816, he could not believe the fact till it had been established many years afterwards by Dr. Christison and other observers;* but chemistry goes even further than this, and through the several stages of cyanogen—cyanide of potassium and cyanate of ammonia,—actually forms this supposed exclusively animal substance without recourse to any organic body whatever.

Experiment upon liquids has already demonstrated some circumstances which affect the endosmotic properties of membranes, and will doubtless before long point out many of those additions to, or subtractions from, the blood, which producing alterations in the endosmose of the cell walls and of the blood globules, will materially affect the fluids of the living body in health or in disease.

Observation tends, however, to diminish the importance of the cells of excretory organs as compared with those concerned in *proper secretion*, and by showing that they probably transmit effete matter from the blood almost unchanged into the excretory canals, directs

* Prout on Stomach and Urinary Diseases, 3rd Ed. p. lxxiii.

attention to the blood rather than to the excretory organs themselves for the origin of diseased excretions.

III. No less altered, in the next place, is modern doctrine relative to the office of the nucleated cells in the building up and support of the *solid* parts of the body, and their removal when no longer required.

It is interesting to see the nucleated cells, employed in laying down the several tissues, gradually alter their figure to fibrous, or other more organised form; and if Mr. Goodsir be correct, even up to independent animalcular existence; and on the other hand to observe, when their office has been fulfilled, and still more in diseased cartilage, or other tissue, the gradual deterioration of the cells, and their nuclei, in the processes of absorption and ulceration, and other morbid changes.

And thus it is evident, of what importance are the quality of the fibrinous and albuminous constituents of the blood, in which alone (and probably only in the former) the formative cells can be generated; and also their proportion and relations to the globules and other elements of that fluid, which must influence their nutritive functions.

Investigation begins to show some reason for the increase of fibrine in inflammation, with ready formation of organizing cells in the healthy; and for the unorganizable nature of this substance in the granular matter of scrofula, and the poisonous effusions of the intemperate and anxious; and of the fatty degeneration of the weak and aged;—and in time, perhaps, we shall gain some insight into the mysteries of cancer, where

the cells and their nuclei, instead of healthy organization, acquire a power of indefinite multiplication and self propagation, till almost every part becomes a destructive, and yet rapidly growing morbid structure.

At the same time it must be remembered here also, as with regard to the fluids, that Schwann's idea of the universal agency of the cells in organization, has already been acknowledged, by almost every pathologist, to have been a too hasty generalization; and the organization of the fibrine of the blood under some circumstances without the intervention of cell growth, is again recognised as it was taught by Hunter, and followed out more minutely by Mr. Travers and other observers.

It will probably have been observed, even from this short sketch, that the tendency of modern physiology is to explain many of the phenomena of life on simply *physical* principles. The injudicious efforts of enthusiastic admirers of Hunter, and that even in this theatre, by unduly elevating the "vital properties" so much dwelt on by him, may have led some to turn from his writings as they would from the unprofitable discussions of the vitalists, Stahl or Van Helmont, his immediate predecessors; but Hunter had to combat the extravagancies of the chemical and mechanical physiology of his day, and an examination of the *whole* tenour of his writings will show, that in reality he kept this part of his doctrines in due subordination to the rest.

And have *we* no need of caution against similar extravagances of fancy? if we remember in the physio-

logy of the last century, that Borelli calculated the force of the heart to be equal to 180,000 lbs., while Hales estimated it at 5 oz.; have we not witnessed the contest between the Proteine theories of the philosophers of Giessen and Utrecht?

If we wonder at the absurdities of some of the older theories concerning the nervous system, may we not still smile at the extent to which physical analogies are now sometimes carried? As when, for example, we see nervous matter and muscular structure considered as identical with a galvanic battery;—or when Matteucci calculates the quantity of heat and electricity, and therefore of nervous force, produced chemically by respiration and nutrition in a given time, and finds that a man consumes only 1-34th part of the quantity of carbon which a locomotive engine would require to perform the same journey; or that nervous and muscular force, developed by continued galvanic influence in a living animal, from the oxygenation of a given quantity of zinc, is six times as powerful as if the battery had been employed in generating steam;—confessing, however, with regard to his instruments, that "perhaps for a long time to come, man will not attain that degree of perfection which exists in those living machines, which he knows not how to imitate, and can only admire." *

So also when Poisseuille and Barchette, finding by experiment that endosmose takes place through dead animal tissues, between the serum of the blood and solutions of sulphate of soda or seidlitz water, at rest or in motion, would thence explain the action of a purga-

* Matteucci, op. cit. p. 325, 326.

tive salt as being also simply endosmotic, but leave the fact unaccounted for, that a few grains of dry calomel will produce the same effect of copious discharge of serum from the intestinal surface. *

It is encouraging, however, for our future progress, to observe, that modern physiologists and pathologists, are not apt to look to a single cause for the actions of so complicated a structure as the animal body; they are not all vitalists, or solidists, or humoralists alone; nor do they wish to explain every thing on *merely* chemical or electrical or mechanical principles; they know that the tissues may be at fault at one moment, and the fluids at another; that capillaries, nerves, and circulating blood, may all be concerned in one local morbid affection; and that although advancing science has explained much, which was till of late mysterious, both in health and disease, there may yet be some controling power in the living body, which may so modify the operation of physical causes, as to leave much for ever hidden from their finite capacities, for which they can only employ the term, "vital affinities" or "vital actions," which, to use the words of Dr. Alison, "take place chiefly in that part of the system where the solids and fluids are most intimately mixed, and are continually exchanging particles." †

Again, it will have been observed, from the same sketch, with regard to pathology, that every thing tends

* Matteucci, op. cit. p. 73.

† Outlines of Pathology.

at present to give increased importance to humoral doctrines; and nothing more strongly than the recent discovery of urate of soda, by Dr. Garrod, in the blood, in health as well as in gout, leading to the great probability that in many other disorders also, a materies morbi is generated, which must be separated from the system for their cure; sometimes the purification being attempted by nature, though perhaps her very success is fatal, as when the insoluble salt of gout is indeed eliminated from the blood, but is deposited among the solid textures, so as to cripple every joint; at other times, in a more perfect manner by remedial art, and with more certainty and at much less expense to the system, than by simple empiricism.

Iodine has been discovered, by Dr. Christison, in every fluid, even in the aqueous humour of the eye; our remedies may, therefore, be sometimes universally employed, while at other times elimination is sought for through some one or more of the great emunctories of the system, and especially by that excretion by means of which, for obvious reasons, most good has hitherto been effected.

And yet, even in this well-investigated subject, the very changes of health are not fully distinguished from those of disease: my friend, Dr. Bence Jones, for example, informs me of the singular fact that the acids of the urine are gradually lessened, sometimes even to alkalescence, after every meal, and then gradually increase again, till there is more acid than before; so that the degrees of acidity in the stomach, according to its state of fasting or repletion, may probably be ex-

pressed by lines, which rise and fall inversely with those which represent the urinous acidity; but with the addition of this anomaly, that when the acidity is greatest in the urine the quantity of uric acid is the least, and the uric acid is in greatest quantity, when the urine approaches to alkalescence.

What numerous discoveries must, therefore, yet await us by assiduous investigation of the many other complicated secretions of the body; above all, what a rich field of inquiry lies open from analysis of the source of all animal substances, whether solid or fluid, normal or diseased,—the blood itself.

Already are we familiar with the terms anæmia, hyperæmia, spanæmia, cachæmia, to designate some of the pathological conditions of this fluid, and yet so completely is our knowledge of the blood yet in its infancy, that the very cause of its colour is still a questio vexata; how little, therefore, can we expect yet to understand of its morbid states.

Mr. Hunter, constantly speaking of the "vital actions" of the solids, was, nevertheless, a humoral pathologist beyond his age. If a philosophic pathologist of the present day, Dr. Williams, proposes the not inappropriate term, necræmia,* to explain one of five modes in which the life of the higher animals may be destroyed, Hunter also says, "I even suspect death in the blood can take place independent of the solids, but the death of the solids must soon follow." He also declares, as is well known, "I am apt to believe

* Williams's Principles of Medicine, p. 464.

the life of the blood begins before it becomes solid, and becomes a part of the body;" and "the blood is as capable of diseased actions as the solids." *

It is curious to trace his great doctrine of "the life of the blood," at one time exalted to extravagance, next falling into almost universal disbelief; now again, like many of his discoveries, which were scarcely capable of appreciation when first promulgated, brought forward with all the force of novelty, and satisfactorily proved in many points, but in danger, perhaps, like some points of modern physiology, of being carried to a greater theoretical extent than Hunter thought of, or than facts will justify.

Acknowledging the important agency of a fluid containing such a variety of elementary substances in the formation, by incessant change, of new *chemical* compounds, are we warranted in assuming, with some pathologists, that it can originate within itself, independent of the cells of the vessels containing and circulating it, such changes as produce *organic* structures? Have we yet sufficient proof that a conversion of the white granules into pus globules can take place in and by the circulating blood, constituting a real pyæmia? And if we find organised encephaloid matter in the recent lymph of serous effusions, and in the coagula in the veins of cancerous tumours, are we yet warranted, as Cruveilhier and other pathologists have done, in investing the white or the red globules, or any single component part of the blood, with vital formative properties analogous to those of the cell-germs of organic

* Hunter's Works, vol. i. pp. 231—233.

structures,—a step far beyond the degree of vitality assigned by Hunter to the blood?

The marvellous discoveries of the last quarter of a century, and the rapid progress observed in every art of life, may, however, excuse some over confidence in individual experience, some hasty publication of theories and speculations, based on imperfect observation, and sometimes supported by very illogical reasoning,—"Omnia non properanti clara certaque sunt, festinanti improvida et cæca," * is, however, a true maxim, and those who are inclined to an indiscriminate adoption of every novelty, and who find the bold and specious theoriser more seductive than the calm and cautious philosopher, and an unknown but foreign name more potent than one more familiar, but of immeasurably greater real weight, will do well to remember the forty years of laborious investigation spent by Hunter on his work on the blood and inflammation, canvassed, and criticised, and altered by a committee of his friends, and scarcely ended with his own life.

On the other hand, if Harvey and Hunter were thought, by their cotemporaries, to be enthusiasts, whose imagination was not kept in check by their judgment, it cannot, I think, be said with truth, that there is now displayed any want of readiness to investigate suggestions in practice, or in the sciences connected with it, which are presented on adequate authority, or which are not inconsistent with rational principles: in fact, the portals of medical science are

* Livy.

so widely thrown open, that any indisposition in those who occupy them to test alleged discoveries would soon be overpowered by public impatience at their apathy.

There was nothing, for example, contrary to physiological principles in the idea that gaseous substances, like ether, and subsequently chloroform, should quickly be absorbed into the blood; and therefore how widely and universally was the chance discovery of an American dentist, confessedly ignorant of chemistry, tried by the surgeons of this country! Wonderful indeed, and of incalculable importance to mankind, is this discovery of the all-pervading influence of subtle poisons, in a few seconds overpowering consciousness and sensation and voluntary movement, and proving, by daily experiment, not on the lower animals, but on living man, how close are the confines of life and death, and yet safely used in the earliest infancy, or in the most advanced age; destroying all suffering and all apprehension of it in some of the most fearful circumstances of life, and at the same time diminishing their fatal effects.

If, indeed, I am justified in applying the term chance to the discovery of anæsthetic agents, instead of admiring the preference given by a higher power to so humble an instrument, rather than to the science of Sir Humphrey Davy, who, by a remarkable anticipation, nearly half a century ago, actually proposed one of these substances, nitrous oxyde gas, "as a means of destroying physical pain during surgical operations." *

* Researches, Chemical and Philosophical. Works by Dr. Davy, vol. iii. p. 329.

Nor are such investigations confined to modern opinions or discoveries, but truth or error are sought for in questions long considered as demonstrated. I would instance the fallacies, proved by Dr. G. Burrows to exist in Dr. Kellie's experiments, on the influence of atmospheric pressure on the circulation of the brain,—so important in reference to the treatment of the injuries and diseases of that organ;—and the revival of pressure as a safer and easier mode of cure for aneurysms of the extremities, previously laid aside because it had been erroneously concluded, by mere inference from analogy, that total and continued cessation of the circulation of blood in the tumour was necessary for its coagulation.

It has been said by Humboldt that, "excited by the brilliancy of new discoveries, and fed with hopes, of which the delusiveness is not discovered till late, every age dreams that it has approached near to the culminating point of the knowledge and comprehension of nature."* I am, myself, however, well aware of the gradual, and often slow progress made by science when it depends in part on accumulation of facts, and how difficult it often is to perfect a single point which subsequently appears exceedingly simple. It would seem almost inexplicable to us, that Mr. Hunter should have failed to recognise the right method of applying the ligature in his operation for aneurysm, did we not remember how long afterwards Scarpa continued to apply the large and numerous ligatures which he had

* Humboldt's Cosmos, by Col. Sabine, vol. ii. p. 357.

seen first used, and how very recently so experienced a surgeon as Dupuytren included the vein and artery in the same ligature, when Brasdor's operation on the distal side of the tumour was revived in this country by Mr. Wardrop.

I am well aware, also, that so much still remains, and must ever remain, unknown regarding the animal frame, that although it is wrong to call medicine entirely a conjectural art, yet it cannot be elevated to the rank of an exact science. The wisdom of experience, which is rational empiricism, should be felt in ours as in other professions, and there must still be room for theory and variety of opinion. It is related of Hunter, that to a pupil who remarked to him that he had said differently on the subject last year, he replied, "Never mind what I *then* thought, I will tell you my present opinion." In this respect, at least, Hunter is imitated by his successors. Notwithstanding the long existing confidence of the navy in the efficacy of lime juice and other acids, even potash, although so opposite, has recently been recommended for the cure of scurvy,* now so curiously revived, after it had almost disappeared from the catalogue of disease;—who can glance at the endless variety of strongly vaunted remedies for the still more formidable epidemic once more visiting these lands, without exclaiming with the dramatist,

"Fecistis probe,
Incertior sum multo quam dudum."

But on the whole there is much ground for encou-

* Dr. Garrod, on the nature, cause, and prevention of Scurvy; Edinb. Monthly Journal of Medical Science, Jan. 1848, p 457.

ragement and hopeful expectation in the spirit with which physiology and pathology are at present cultivated; and if some are hasty and visionary, and others incredulous, and laudatores temporis acti, there is, I believe, among the members of our profession, more general soberness, and candour, and diffidence, and earnest search after truth, than at any former period, acting, moreover, under much more favourable circumstances.

It was said of geographical discovery, by the historian of America, "During the course of the 15th century mankind made greater progress in exploring the state of the habitable globe than in all the ages which had elapsed previous to that period. . . . . In comparison with events so wonderful and unexpected, all that had hitherto been deemed great or splendid faded away and disappeared. Vast objects now presented themselves. The human mind, roused and interested by the prospect, engaged with ardour in pursuit of them, and exerted its powers in a new direction." *

Similar to this is the rapidity with which general science advances at the present time; every day does some new discovery astonish the world; and fresh points of contact, and new links of connexion, between our own and various collateral sciences, become evident. It cannot be but that the increasing flood of light, which is shed over general science, should in some measure illuminate medical science also.

Surely I have said enough regarding chemical in-

* Robertson's History of America, book 2, p. 141, 8vo. Ed.

vestigation to disprove the estimate formed by an excellent practical teacher, when he says, "As to any benefit derived from analytic chemistry in solving the problems of vital action, or elucidating the functions of the various organs, in health and disease, they may be said to be few, and unimportant, and inconclusive." *

Nor can I agree with those, by no means few in number, who, remembering the errors of the supposed discoveries of the early part of this century, by means of the compound microscope, experience an equal distrust of the simpler achromatic lenses of the present time, as assisting the anatomist and chemist; although, in fact, the microscopical descriptions of Leuwenhoek or Boerhaave, a century ago, from their single glasses, are still accurate and true.

The Microscope appears at present to be effecting changes in our knowledge of nature, no less wonderful than those views, which similar instrumental improvements are opening to our senses through the telescope; I know not which extreme in magnitude is most calculated to excite our admiration and our reverence for our common Creator—the contemplation of the estimated 18 millions of telescopic stars in the milky way, or the 40,000 millions of silicious shells of Galionellæ, according to Ehrenberg's calculation, in a single inch of polishing slate! †

With more moderate views of its utility, perhaps,

* Graves's Clinical Medicine, p. 30.

† Humboldt's Cosmos, voi. i. p. 140.

than some may entertain, the Council have not been unmindful of the benefits which anatomy, physiology, and surgery may derive from the use of the microscope. They have availed themselves of the peculiar talents, for this purpose, of their assistant conservator, Mr. Quekett, to institute an annual course of demonstrations, the value of which is attested by the presence of an increasing number of the members of the College.

They have purchased a large number of beautiful preparations of minute structure, both natural and morbid; and at no trifling cost they have commenced the publication, of what, under the name of a catalogue, is in reality a splendid series of several volumes of engravings, every figure in which, traced by means of the Camera Lucida, presents, as I know by official inspection, not a mere resemblance, destitute of exact measurement and proportion, and therefore open to dispute, but like the daguerreotype portrait, possesses the undoubted merit of faithfulness and truth. The first volume, now on the eve of completion, will, in fact, serve (without the necessity of reference to the collection itself) as a complete treatise of general minute anatomy and physiology; and the whole work, I trust, will reflect credit on the College.

Even the more stationary branches of physical science have, within these few years, contributed something towards medicine; as, for example, the stethoscope, the hydrostatic bed, the ingenious spirometers of Hutchinson and Sibson, and the immoveable dex-

trine or gum splints, so invaluable in the treatment of fractures and diseased joints. Much more, then, may we expect for pathology and practice, from those sciences, whose progress has been so rapid, as almost to exceed belief.

Take, for example, the subject of electricity ;—even within these few months, two small plates of zinc and copper, united by a copper wire, and wrapped on a diseased limb by means of moistened linen, have been employed—to restore motion to a palsied limb ; to produce an issue under the zinc, while the copper plate remains harmless ; to cause, on the one hand, a healthy action in an indolent ulcer, and on the other, to destroy the vitality of a morbid growth.*

How fertile a field of inquiry is probably open from our gradually increasing knowledge of the varying conditions of the same electric power in relation to its atmospheric influence on the whole of the animal and vegetable economy; and therefore, probably, in the production of disease—especially those of formidable epidemic kind ;—whether this electric power be traced in its regular diurnal variation, or in the awful explosion of the thunder cloud, or in the silent magnetic storm, unnoticed save in the observatory, and yet affecting a large portion of the globe ;—even the mere form, not of the mountains, but of the lesser works of man, disturbing the electric relations on the earth's surface ;—if Professor Schonbein is correct in his detection, by means of iodide of potassium, of the conti-

* Medical Gazette, July 7, 1848.

nual emanation of Ozone from pointed bodies into the atmosphere.*

But may I venture to ask, whether we may not derive a useful lesson for our professional studies from considering and imitating one element of success, in the mode in which some of these sciences are cultivated. In reading the works of adventurous voyagers, such as the latest of them, Sir James Ross, we cannot but be struck with interest by the numerous directions, in which the varied knowledge of such men is brought to bear on science; the magnetism and structure of the earth,—the temperature and composition of the waters at a depth as great as the summit of the Andes,—the different vegetable and animal productions of land and water,—the tidal movements,—the appearance of the heavenly bodies, and numerous other subjects of interest and importance. But if such observations are carried on amid the dangers of the Antarctic circle, in the same manner and often at the same fixed moment, are corresponding records made by others, in concert and agreement with them, in the Arctic regions, in the Tropics, and in the eastern and western hemispheres; and the nature and method of these investigations are previously considered and deliberately agreed upon, by men most eminent in each of these several pursuits; by whom, also, subsequently, the results of these inquiries are anxiously compared and analyzed, and their value duly weighed.

Would not the stimulus of some such concert and

* Medical Gazette, Oct. 1848.

controlling power as I have alluded to in others, advance medical science also, more steadily, step by step, in the right direction, and at the proper time, through the combined efforts of many now isolated labourers? Would it not check many crude and ill-digested hypotheses, prevent the repeated revival of disproved facts and exploded theories, and give a higher value to original discoveries?

Would not, especially, such a system of co-operation work for good in public medical institutions? In each of the different hospitals of this metropolis, for instance, there is much local traditionary knowledge of intrinsic merit, which is confined to its own pupils —in each there are peculiar modes of treatment, which are not always different roads leading with equai advantage to the same end;—nay, their doctrines are sometimes so opposite, that a form of tumour which is regarded in some schools as cancerous and constitutional, is considered in others as fibrous and purely local.

The large scale on which science and practice are in them combined and publicly administered, makes hospitals the only safe standard of statistical information. Private experience is too limited, and the effects of treatment recorded in medical writings, greatly too successful, to express the whole truth. It could not be, but that the united and publicly known results of hospital experience, preserved on one concerted and uniform plan, were it only for the short period of a few years, would afford a mass of most valuable information, now in great measure lost or insulated, which

would enable those, who have the peculiar taste and talent necessary for the very difficult task of statistical analysis, to solve a great number of most important questions in medical and surgical practice, in which, therefore, comparative certainty would take the place of the ever-changing aspect of personal experience.

It is very gratifying, however, to witness an increasing co-operation, and appreciation of each other's merits, among the cultivators of science in different nations; and doubtless we must acknowledge ourselves largely indebted to other countries, particularly to the Germans, for much of that minute pathology to which I have drawn a passing attention this day.

It is pleasant to see the medals of our Royal Society awarded to Berzelius, Matteucci, Schwann, Dumas, and Liebig, for the labours, by which they also have forwarded medical science, and to see a British philosopher, Sir David Brewster, fill that honorable place in the French Institute, which has recently been vacated by the great Swedish chemist, Berzelius.

Let me observe, in conclusion, that it is also gratifying to witness an increasing sense of the benefits, and the pleasures, which may be derived from scientific knowledge by persons in every rank of life,—a sense which has been constantly evinced by the Illustrious Personage, whose love for science has prompted him this day to honour our theatre with his presence.

No doubt, Sir, our President will have expressed to you, better than I can do, the deep sense of your

Royal Highness's condescension, which will be felt, not only by this assembly, but by every member of this College.

I will, therefore, only presume to add, that as it is a pleasure to almost every Englishman to see the Prince Chancellor of one of our ancient Universities assist in giving to its inmates that union of modern science and knowledge with classical learning and mental culture, which a conviction of its importance had previously induced him to encourage in the younger students of that great Seminary, which almost forms a part of the palace of our Sovereigns;—so is it also the prayer of every Englishman, that the force of parental example may have its full influence upon those still more youthful descendants of a long line of Princes, whose personal character, thus trained would add stability to the throne itself; even if there should hereafter arise, with fearful rapidity, such an overthrow of governments and dynasties as it has been our fortune, under Divine Providence, to sympathise with, though not to share.

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