

A collection of the published writings of William Withey Gull ... : memoir and addresses / edited by Theodore Dyke Acland.

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Publication/Creation

London : New Sydenham Society, 1896.

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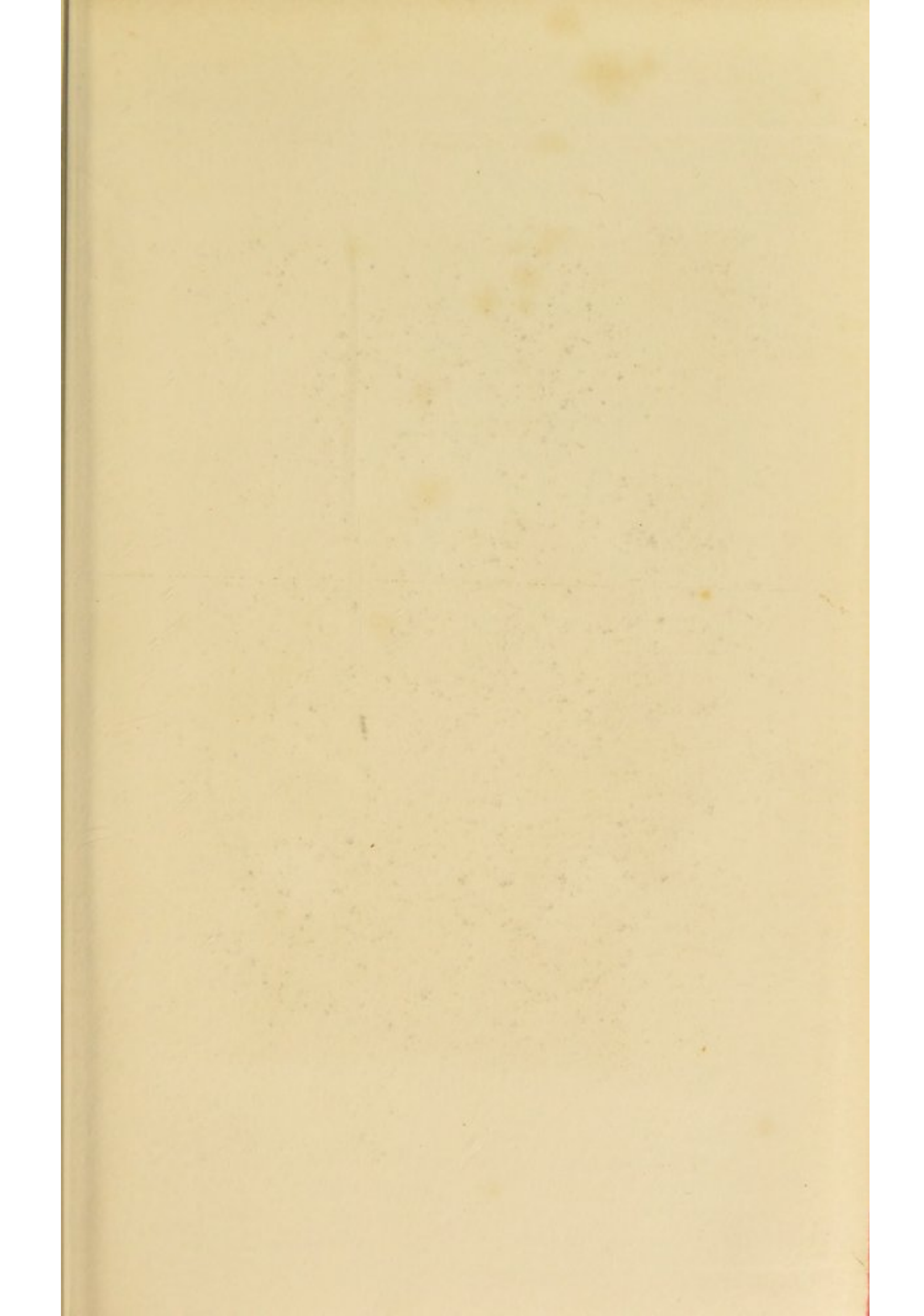
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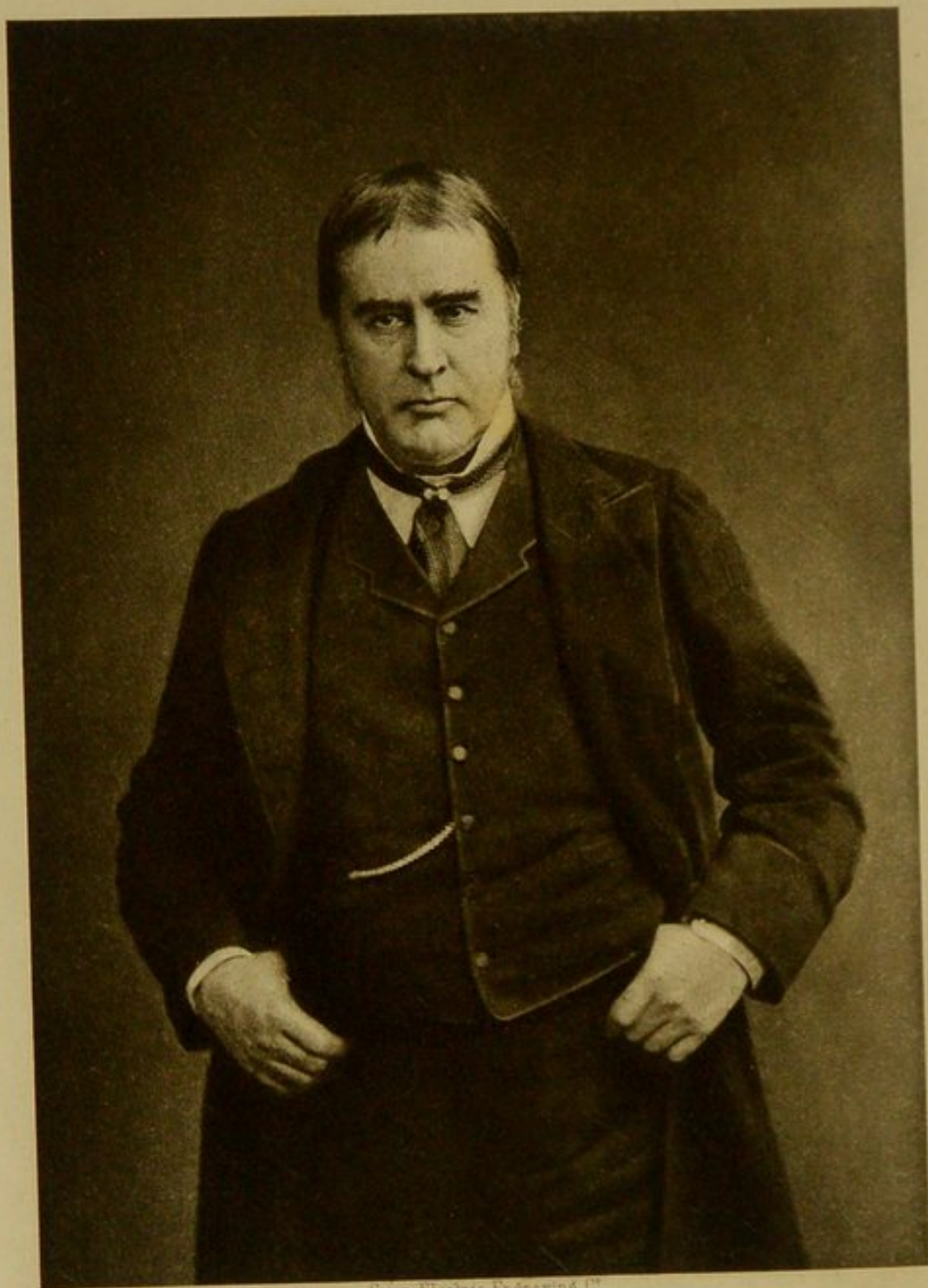
THE NEW SYDENHAM
SOCIETY.

INSTITUTED MDCCCLVIII.

VOLUME 156.







Swan Electric Engraving Co.

July 1881

William H. Hall

A COLLECTION
OF
THE PUBLISHED WRITINGS

OF
WILLIAM WITHEY GULL, BART., M.D., F.R.S.,
PHYSICIAN TO GUY'S HOSPITAL.

EDITED BY
JOHN EDWARD PYKE ACLEND, M.D.,
PHYSICIAN TO ST. THOMAS'S HOSPITAL.
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MEMOIR AND ADDRESSES.

LONDON:
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PRINTED BY ADLARD AND SON,
BARTHOLOMEW CLOSE, E.C., AND 20, HANOVER SQUARE, W.

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PREFACE.

SOME apology is due to the members of the New Sydenham Society for the inevitable delay which has occurred in the issue of the present volume.

It was hoped that Sir Henry Acland would have written the memoir of his old friend Sir William Gull, and indeed he commenced the task, but owing to failing health he was compelled to relinquish it before it was completed.

In the following brief account of Sir William Gull's life, full advantage has been taken of Sir Henry Acland's work. The writer wishes to acknowledge his indebtedness to Dr. Pye-Smith, the author of the obituary notice of Sir William Gull in the 'Guy's Hospital Reports,' of whose article he has freely made use, and to other friends whose help has made the work possible.

An attempt has been made to give a simple portraiture of Sir William's life and ways of acting in it, and rather to describe what manner of man an acknowledged great Physician of our day was, than to discuss the mere extent of professional knowledge which obtained universal recognition.

T. D. ACLAND.

November 5th, 1896.

MEMOIR.

I. EARLY LIFE AND EDUCATION.

THERE is no portion of the history of men of power more interesting than that which tells how and when they first showed their strength. This interest is not lacking in Sir William Gull's early life.

William Withey Gull was born at Colchester, in the parish of St. Leonard's, on December 31st, 1816. His father, John Gull, was a barge owner and wharfinger, and was thirty-eight years old at the time of William's birth. His mother's maiden name was Elizabeth Chilver. He was the youngest of eight children, two of whom died in infancy. Of the remaining six, three were sons and three daughters.

When the boy was about four years old his father removed to Thorpe le Soken, in Essex. He was an honest, upright man, devoted to his children. His mother was a person of remarkable character, and of clear sound judgment; industrious, persevering, and possessed of great ability. Her husband looked to her for advice in every important matter. They were deeply attached to each other, and most anxious for the welfare and good education of their children. A scholarship at Christ's Hospital was offered by a friend to John Gull for his eldest son, but it was somewhat indignantly refused because, he said, none of his children should ever be dependent upon charity. He died of cholera in London in 1827, when William was ten years old, and was buried at Thorpe.

After her husband's death, Elizabeth Gull devoted herself

entirely to the bringing up of her children. She was left with very small means, but none the less were the surroundings of the home those of refinement and care. She taught her children to be self-reliant, to do everything for themselves, and to do whatever they did well; for she would say, "Whatever is worth doing is worth doing well." Thus she instilled into them habits of perseverance and industry. These early lessons from a loving mother were never forgotten, and may truly be said to have been the key-note of Sir William's success. In looking back to his childhood he would often say that his real education had been given him by his mother. To the end of his life he would quote a little nursery rhyme, learned in infancy :

"If I were a tailor, I'd make it my pride
The best of all tailors to be ;
If I were a tinker, no tinker beside
Should mend an old kettle like me."

Adding to it in later years, the more classical quotation—

"If thou dost purpose aught within thy power,
Be sure thou do it, though it be but small.
Constancy knits the bones and makes us stour."

Elizabeth Gull was an earnest Churchwoman of an old, but then not common type. On Fridays the children had fish and rice pudding for dinner; in Lent she wore black, and the Saints' days were carefully observed.

As a boy William Gull went with his sisters to a school kept by two old ladies, and he used to say that on his return home his mother never allowed him to play until he had done a certain number of rows of knitting, and he would sit on a stool and look at the clock to see how fast he could accomplish this appointed task. Thus he knitted the first pair of stockings he wore. When too old to go with his sisters to their school, he attended another in the same parish, kept by the clergyman. At this school William was a day-boy until he was fifteen, at which age he became a boarder, and continued so for two years. It was at this time that he first began to study Latin. The learning, however, that the clergyman was able to impart appears to have been very limited; and at seven-

teen William announced that he would not go any longer, as he had learned all that his master could teach him. Shortly after this he became a pupil-teacher in a school kept by Mr. Abbott at Lewes. He lived with the Abbotts, who were kind, cultivated people, as one of their family, and received such education as the school could give, and in return he helped in the teaching. He now began to study Greek, which, for the most part, he taught himself; and before long he was desired by Mr. Abbott to teach it; he was unwilling to undertake the task, feeling how little he knew, but Mr. Abbott reassured him, saying, "Directly you begin to teach you will begin to learn;" so he began to teach Greek. Whilst at Mr. Abbott's he became acquainted with the well-known botanist, Mr. Joseph Woods, and with him he used to wander over the downs at Lewes, and study the flora and fauna of Sussex.

After being with Mr. Abbott for about two years he again became unsettled, feeling that the opportunities he had of acquiring knowledge were not equal to his powers. He would in after years refer to the anxiety and distress he experienced at this period of his life, owing to the inadequate means at his disposal for satisfying the desire for knowledge, and the capacity for learning of which he felt himself to be possessed.

The influences of his early life had led him to wish to go to sea. Finding himself disappointed in the endeavour to obtain the education for which he longed, his mind reverted to this desire, but his mother would not give her consent. At this time Mr. Harrison, nephew of the Treasurer of Guy's Hospital, was rector of Beaumont, a parish adjoining Thorpe, on the estate of Guy's Hospital, to which in 1832 Elizabeth Gull had moved her home. Mr. Harrison took a kindly interest in his parishioners, and specially in William Gull's widowed mother. To him she related her trouble as to her son's desire to go to sea. Mr. Harrison then proposed that the boy should come to the rectory every other day, and with him resume his classical and other studies; and this for a year he did. On his days at home he and his sisters would row down the estuary to the sea, watching the fishermen, and

obtaining the mysterious living treasures that teem in the nets of the dredgers on all our coasts. The specimens thus obtained, as well as any others of the fauna of the district which he could collect, were carefully examined and studied with the aid of such books as he could then procure. This time was always looked back upon as one of the happiest periods of his youth, satisfying and yet kindling his longing for knowledge, and opening to him new interests and new views of life.

From the nature of these studies, and probably from his intercourse with Mr. Harrison, the thought of a sea life faded away, and the wish to study medicine became the fixed desire of his life. There appeared, however, no prospect of obtaining the means to enable him to undertake the long and necessarily expensive education that such a career would involve.

About this time Mr. Benjamin Harrison, the Treasurer of Guy's Hospital, came to stay with his nephew, the rector of Beaumont, who, having become deeply interested in young Gull, spoke to him about the boy, and took him to see Gull's mother. Being satisfied that he was possessed of unusual ability, Mr. Harrison invited him to go to Guy's, and in September, 1837, the autumn before he was twenty-one, William Gull left his home and entered upon his life's work.

Formerly students of medicine went to the hospital chiefly as "apprentices." By the Treasurer's kindness Gull shared all the advantages of an apprentice; he gave him two rooms in the hospital with £50 a year, and every opportunity of study.

"I can help you if you will help yourself," was Mr. Harrison's wise saying, and this advice Gull determined to act upon. On one occasion, anxious to make some return to the Treasurer for his friendship and kindness Gull resolved to try for every prize which could be competed for in the hospital in the course of that year. He succeeded in gaining every one.

During the first year of his residence at Guy's, together with his other studies he carried on his own education in Greek, Latin, and Mathematics, and in 1838 he matriculated at the University of London, then only recently founded.

In 1841 he took his M.B. degree, and gained honours in Physiology, Comparative Anatomy, Medicine, and Surgery.

Throughout his early career at Guy's, he owed much not only to the Treasurer, who through life continued one of his firmest friends, but also to Mr. Stocker, then apothecary to the hospital, with whom he was closely associated in his work, and who aided him in every way in his power. He also received from various members of the medical staff, much kind encouragement and help, which were never afterwards forgotten. Amongst these friends may be specially mentioned Dr. Babington, whose memory Sir William always cherished with feelings of deep admiration and gratitude.

In 1842 Gull was appointed to teach *Materia Medica* at Guy's Hospital, and the Treasurer gave him a small house in King Street, with a salary of £100 a year.

In 1843 he was appointed Lecturer on Natural Philosophy. He also held at this time the post of Medical Tutor at Guy's, and, in the absence of the staff, shared with Mr. Stocker the care of the patients in the hospital. In the same year he was appointed Medical Superintendent of the wards for lunatics, and it was largely due to his influence that these cases shortly ceased to be treated at the hospital, and the wards were converted to their present use.

Through all these years Gull continued to observe, to study, to practise, and to teach, without intermission. His various duties gave him unrivalled opportunities for becoming acquainted with every form and variety of disease, and of these he availed himself to the full. His life, as he himself used to say, was at this time lived within the wards of the hospital, and at all hours of the day, and often at night also, he might be found by some bedside seeking patiently to unravel the mysteries of disease.

In 1846 he took his M.D. degree at the University of London, and gained the gold medal, the highest honour in medicine which the University can confer.

Notwithstanding his great ability, he had at this early period of his career a remarkable lack of confidence in

his own powers, as is shown by the following incident. During the examination he was about to leave the room, saying that he knew nothing of the case proposed for comment; fortunately a friend persuaded him to return, with the result that the thesis he then wrote gained for him his Doctor's degree and the gold medal.

From 1846 to 1856 Dr. Gull held the post of Lecturer on Physiology and Comparative Anatomy at Guy's.

In 1847 he was elected Fullerian Professor of Physiology at the Royal Institution of Great Britain, a post which he held for two years, during which time he formed a close and intimate friendship with Michael Faraday, at that time Fullerian Professor of Chemistry.

In 1848 he was elected a Fellow of the Royal College of Physicians. He was also appointed Resident Physician at Guy's, and came to reside in the house now occupied by the Chaplain. And here his preparatory training was brought to a close, his full professional habits were formed, and his life responsibilities fairly undertaken.

Dr. Gull married in 1848 Susan Ann, daughter of Colonel Lacy, of Carlisle. Of several children two only survive, a son and a daughter.

II. PROFESSIONAL LIFE.

WHEN, after taking his M.B. degree in 1841, Gull became medical tutor at Guy's, his professional career had fairly begun.

The secret of his success as a physician is well summed up in the words of the inscription to his memory on the tablet in the Chapel at Guy's Hospital;—Instinctive insight, unwearied patience, exact method, ready resources, and above all hearty sympathy. Each and all of these brought their influence to bear on his work and on his life, and made them what they were.

"If I am anything," he once said late in life, when some speech he had made had been misunderstood, "I am a clinical physician." That remark was the key to the life of a powerful, thoughtful, cultivated man, whose chief interest lay in the treatment of disease and the alleviation of suffering, and who brought into play the keenest power of observation, based on scientific scrutiny of the minutest facts which could affect the question before him.

He had a retentive memory and vast knowledge,—scientific, clinical, and pathological,—acquired by many years' residence at Guy's, and constant study at the bedside of the sick. Added to this he had a peculiar capacity for appreciating each detail of the case before him at its proper worth; not being led away by symptoms which, though prominent, might be of little importance, and finding not unfrequently the key to the solution of a problem in some circumstance or detail which had attracted but little attention.

If a case was not clear to him, he did not hesitate to say, "I do not know." He writes: "Acquaint yourself with the causes that have led up to the disease. Don't guess at them, but know them through and through if you can; and if you do not know them, know that you do not, and still inquire. 'Cannot' is a word for the idle,

the indifferent, the self-satisfied, but it is not admissible in science. 'I do not know' is manly if it does not stop there." He acted on Newton's words, which he often quoted: "If I do not understand a thing, I keep it before me and I wait." He never wearied of inculcating the principle that it is more important to study than to explain the phenomena of disease. One of his favourite sayings was, "Fools and savages explain; wise men investigate."

It has been said of Sir William by one of his most distinguished contemporaries: "Science and sympathy were in complete agreement in him." He possessed in a marked degree those characteristics which inspire trust and exercise a powerful influence over others; and to a profound knowledge of his profession, Sir William added a profound knowledge of mankind.

A passage from the 'Guy's Hospital Reports'¹ admirably describes him.

"His striking presence, his searching scrutiny, his minute and deliberate examination of every case, and the few carefully and slowly uttered words in which he delivered his judgment, sometimes with epigrammatic pungency, often with encouragement, and never without sympathy—all combined to give him an almost unequalled ascendancy over his patients. His manner was his own, and sprang naturally from the habit of his mind. It was just the same in a hospital ward as in a palace, and the poorest of his patients leaned on his oracular statements, sometimes with hope and sometimes with resignation, but always with comfort; while the richest were taught to restrain loquacity, to answer truthfully, and to follow out directions implicitly.

"The merit of Gull, as of Stokes, Oppolzer, Trousseau, and other great physicians, was that he added to the methodical investigation of facts the insight and judgment without which a man may be an admirable clinical teacher, and yet entirely fail in the diagnosis of really difficult cases, in the estimation of probabilities, and in wise therapeutics. For practical medicine is an art; and when all the facts which the most elaborate examination of the patient's actual state can supply have been brought in due order before us,

¹ Vol. xlvii.

and the seat and nature of the anatomical lesion has been accurately determined, there still remains the due appreciation of its significance in that particular case, of the probabilities of its future progress, and of the most suitable methods of meeting it. Indeed, in many cases the result of physical diagnosis is little more than negative, and we have to depend entirely upon the same half-unconscious use of experience in combination with slight and almost indescribable indications, which is depended upon in critical moments by the physician no less than by the engineer, the seaman, the statesman, and the general.

"While not inferior to the best modern teachers in accuracy and thoroughness of searching for physical signs of disease, Gull added to this the vision and the faculty which depends upon long and well-used experience, combined with a certain happy mixture of boldness and caution like that which decides a doubtful field of battle."

There was no detail which concerned the comfort or well-being of the patient which was too minute for his attention. He knew the relief which might be gained by change of posture, by altering the position of a limb, and not only saw that it was done, but frequently did it himself. His ready tact in dealing with the whims and sufferings of the sick often called forth more admiration, from patients and friends, than even the exercise of his professional skill. In dealing with disease he never lost sight of the personality of the patient; each case, he would say, should be considered as "the disease, + the person."

Visiting one day an hysterical lady whom he had seen previously, and who was causing great anxiety to her friends and medical attendant, he reassured them, saying, "There is nothing really wrong; Mrs. X. is herself multiplied by four." An over-anxious patient was encouraged and cheered by being told that he was "a healthy man out of health."

In many instances he did more for the cure of those under his care by saying little and doing nothing than could have been effected by much treatment.

On one occasion a lady suffering from an obscure skin disease was brought to him for an opinion. He examined

her, picked a minute fragment of cantharides from one of the sores, placed it under the microscope and showed it to her, with the assurance that she would get well. He did nothing more, and the cure was complete.

On another occasion at a consultation 200 miles from London, he refused, to the dissatisfaction of his colleague, to write a prescription, because, he said, the patient only required the encouragement of being convinced that he did not need drugs for his recovery.

Every consideration that did not relate to "*what is best for the patient*" was dismissed. This was Sir William's professional axiom. How hard it is fully to act on this seeming truism amid all the complexities of human life—moral, physical, social, financial—this is not the time or place to discuss. But the carrying of it out not unfrequently involved him in difficulty, and led occasionally to his being misunderstood. The story already told of his travelling to the north of England and returning without writing a prescription for his patient, may be instanced; and he would frequently refuse to repeat a visit or consultation on the ground that he wished the sufferer to feel that it was unnecessary.

The severe illness of H.R.H. the Prince of Wales from typhoid fever in 1871, gave Sir William an exceptional opportunity for the exercise of his varied powers as a physician; and the following passage which appeared in the '*Times*,' December 18th of the same year, is of interest. It not only marks the estimation in which his services were held by those who watched by the sick bed at Sandringham, but it gives a striking illustration of that minute care in detail which was so characteristic of his treatment of the sick. "In Dr. Gull were combined energy that never tired, watchfulness that never flagged; nursing so tender, ministry so minute, that in his functions he seemed to combine the duties of physician, dresser, dispenser, valet, nurse,—now arguing with the sick man in his delirium so softly and pleasantly that the parched lips opened to take the scanty nourishment on which depended the reserves of strength for the deadly fight when all else failed, now lifting the wasted body from bed to bed,

now washing the worn frame with vinegar, with ever ready eye and ear and finger to mark any change and phase, to watch face and heart and pulse, and passing at times twelve or fourteen hours at that bedside. And when these hours were over, or while they were going on—what a task for the physician!—to soothe with kindest and yet not too hopeful words her whose trial was indeed great to bear, to give counsel against despair, and yet not to justify confidence.” After the recovery of the Prince, Sir William remarked, “He was as well treated and nursed as if he had been a patient in Guy’s Hospital.”

As a clinical teacher (reference may again be made to the memorial inscription) “few have excelled him in the depth and accuracy of his knowledge, in the lucidity and terseness of his language, in the effect produced upon his hearers.”

His influence over his pupils was great, not only from the extent of his knowledge and the originality of his views, but also from his personal character. He seemed to feel instinctively what was the condition of the student mind,—its wants, and its capabilities; and how its faculties should be nourished and augmented. He presupposed very little knowledge on the part of the students, and he was clear, precise, and suggestive.

He endeavoured to cultivate in them the same painstaking habit of mind, the same care for detail, which so remarkably distinguished the character of his own work. He writes, ¹“The student of medicine can no more hope to advance in the mastery of his subject with a loose and careless mind than the student of mathematics. If the laws of abstract truth require such rigid precision from those who study them, we cannot believe the laws of nature require less. On the contrary, they would seem to require more; for the facts are obscure, the means of inquiry imperfect, and in every exercise of the mind there are peculiar facilities to err.”

At the same time he sought to impress upon them the need of broad views and high ideals: ¹“The scope of Medicine is so wide as to give exercise to all the faculties

¹ ‘Study of Medicine.’

of the mind, and it borrows from the stores of almost every form of human knowledge—it is an epitome of science; its operations are so benevolent, that our Divine Master Himself assumed its offices as a type of His spiritual ministrations; it has in it the very quality of mercy, and—

‘Is twice bless’d;

It blesses him that gives, and him that takes.’

“Medicine holds a foremost rank amongst the natural sciences, and can only reach its full development as they advance to perfection. It is the centre to which some of their brightest rays converge; for where beside can we look for such illustrations of the highest expression of natural laws as are found in the structure of the living body? It has been well said:

‘Man is one world, and hath
Another to attend him.’

“The first principle for the student to recognise, and one to which in after life he will often have to recur, is that his work lies not in the fluctuating balance of men’s opinion, but with the unchangeable facts of nature.”

The following passages, although not primarily addressed to students, further illustrate Sir William’s views on this point:

¹ “The distinction of medicine, as a study, lies in its comprehensiveness. The student of physical science admits that he has to deal with but one half of that truth which is expressed in man. The student of medicine cannot so limit himself. The facts of sensation, whether pleasurable or painful; the influence of the mental emotions, whether exciting or depressing; the dominion of the conscience, approving or disapproving, are for him facts due to the operation of laws into which he must inquire. Looked at from the point of view which the student of medicine occupies, these higher facts of man’s nature are as essentially parts of one law, and control and modify human existence equally with those lower conditions with which physic alone is concerned. This constitutes the unspeakable difficulty which every student of medicine must feel in the present

¹ Harveian Oration.

imperfect state of knowledge. To hold the mind in an equal balance as it passes from the contemplation of the lower facts of our existence to those which characterise the highest claims of our humanity, so as neither to degrade the one nor neglect the other, is one of the highest attainments. What eye is single enough to survey the range of life from the material atoms which build our structures, to those 'mighty hopes which make us men,' without faltering in the vision, or without confusion of the objects? "

¹ "I believe that, as men occupied with the study and treatment of disease, we cannot have too strong a conviction that the problems presented to us are physical problems, which perhaps we may never solve, but still admitting of solution only in one way, namely, by regarding them as part of an unbroken series, running up from the lowest elementary conditions of matter to the highest composition of organic structure."

At all times he strove to guard those he taught against a narrow specialism; he would say, "there are no *parts* in the body, but only different *localities*," and as is well known he regarded chronic Bright's disease as an affection of the whole arterial system, not one of the kidneys only. Of a specimen of contracted kidneys exhibited by Dr. Bright as a cause of albuminuria he used to say, "Bright observed the heart and kidneys, but he forgot the man between; the whole man should have been included in the specimen."

He urged the cultivation of a docile spirit, as essential to scientific study.

² "If the first lesson be patience, . . . the next lesson is docility, a readiness to learn at any source, . . . wherever the facts lie hid. . . . Who could have believed that the particles of a dew-drop and the masses of a planet are moulded and controlled by the same force; that the introduction into the human body of a small particle of matter from a cow's udder might be the means of saving thousands of human lives? We learn from these and innumerable similar instances that the highest truths lie hid in the simplest facts; that, unlike human proclamations,

¹ Hunterian Oration.

² 'Study of Medicine.'

nature's teachings are not by sound of trumpet, but often in the stillest voice, by indirect hints and obscure suggestions, but always with the unequalled advantage that they are unequivocal, constant, and uniform. The difficulty, however, is in maintaining the docile spirit of which I speak, in preventing ourselves from assuming a knowledge we have not; in not hastily coming to a conclusion without evidence, and not resting content in our ignorance with a fool's satisfaction that no good would come of more knowledge if we had it."

He encouraged his students to educate themselves. ¹ "Medicine," he writes, "is essentially a learned profession. Its literature is ancient, and connects it with the most learned periods of antiquity; and its terminology continues to be Greek or Latin. You cannot name a part of the body, and scarcely a disease, without the use of a classical term. Every structure bears upon it the impress of learning, and is a silent appeal to the student to cultivate an acquaintance with the sources from which the nomenclature of his profession is derived."

An old student gives the following interesting reminiscences.

"It was a pleasure to work for him; he would make the less ardent student feel a personal interest in his work, and a responsibility for the welfare of the patients. For though often he would talk freely about a patient, yet he never forgot that it was a human being with human ties that had to be looked after. I well remember his looking sadly at a policeman, moribund of typhoid fever. The man had been keeping at his work long after he ought to have given in; but he had a sickly wife and family who needed his full earnings. Gull turned round and said to the students, 'More heroism there, in working with a fever on you, than in rushing into the breach.'

"He was bold in diagnosis, and often astonished men by the minute accuracy of his prophecies. Of course, like all men he made mistakes, but he was able to take care of himself, and I shall not forget one instance of this by which I suffered. While ward clerk for him, a

'Study of Medicine.'

child was brought into the hospital, and Dr. Gull, after a short examination said, 'Measles; keep the little one warm.' The next day it was certain that the child had smallpox, and it was sent out of the hospital. I told everyone that I had got Gull beyond escape, and many students came to see how it would end. When he got to the empty bed, Dr. Gull said, 'Where is our little patient?' I with wicked pleasure said, 'In the smallpox hospital.' He said nothing but passed on, then at the next bed stopped and quietly began thus: 'You know, gentlemen, that I have over and over again pointed out to you that the diagnosis between measles, scarlet fever, and smallpox could be made from a correct history of the development of the symptoms; in the case of this child I trusted to S—; I thought I *could* trust him, but I was mistaken. I am sorry!'

"The way in which he treated *men*, not diseases, was certainly one of his strongest points. 'Never forget that it is not a pneumonia, but a pneumonic man who is your patient. Not a typhoid fever, but a typhoid man.'

"He left his impress on the students who were under him; they felt that they could never know enough of all things to be physicians. He encouraged men to study the Arts, to teach themselves German, and not to neglect the courtesies of life.

"The Sunday morning walks round the wards were full of interests of all sorts, and in the end, on more than one occasion he took me by the arm, and quietly pushing me toward the chapel, said: 'I have taught you all I can this morning, go and learn something there; if from nothing else, from the statue in the chapel, and tell me what the patient helped by Guy was suffering from.'"

A favourite piece of advice to his students was, "never disregard what a mother says;" he knew the mother's instinct, and her perception, quickened by love, would make her a keen observer.

As a guide of conduct in the difficulties of medical practice, he often quoted George Herbert's words:

"Who when he is to treat,
With sick folk, women, those whom passions sway,
Allows for that, and keeps his constant way."

¹ "As a lecturer Gull was careful, instructive, and interesting, full of impressive aphorisms and ripe conclusions, using apt and striking metaphors, and enforcing what he taught by a dignified, slow, and careful reiteration which never wearied, and which it required more than average carelessness to forget."

It has been said that "he seldom delivered a lecture which was not remarkable for some phrase full of wise teaching, which from its point and conciseness became almost a proverb amongst his pupils." His lectures were well attended, and listened to with marked interest.

In 1874, when he gave the introductory lecture at Guy's, so numerous an audience assembled to hear him that the theatre could not accommodate them, and it was found necessary to adjourn to a large public room at the London Bridge Hotel.

Among his public addresses and orations, his Inaugural addresses at Guy's in 1855 and 1874, his address at the meeting of the British Medical Association at Oxford in 1868, the Harveian Oration, delivered in 1870, and his address as President of the Clinical Society in 1872, may be singled out as brilliant examples of his power as an orator, not only for the breadth and depth of their views, but also for the eloquence of the language in which they are clothed. To thoroughly understand his addresses they should be read in full, for neither extracts nor critical summaries alone, reveal the true mind of the man.

¹ "Sir William was generally supposed to be a sceptic as to therapeutics, and his treatment to be what some people call 'expectant,' and others 'do-nothing.' As in most cases of general reputation, the conclusion, so far as it was incorrect, was in great measure due to the very man whom it wronged. If a physician honestly believes that medicine is powerless over disease, he need not relinquish his practice; for it is often well worth a patient's while to ascertain whether he is really ill or not, and what is the nature of his complaint: he may often wisely pay for the knowledge of what is likely to happen, and what cannot be cured may often be prevented.

¹ 'Guy's Hospital Reports.'

But although negative practice may still be followed for the sake of diagnosis and prognosis and prophylaxis, yet an honest disbeliever in therapeutics could never prescribe a potion or a pill without losing his self-respect. As a matter of fact, Sir William Gull often prescribed no drugs whatever, and his prescriptions, when he wrote them, were of extreme simplicity. . . .

"He was never tired of exposing the absurdity of much of the traditional polypharmacy. He would show how much harm may be done by the vigorous treating of half-understood diseases, and he once said that if every drug in the world were abolished a physician would still be a useful member of society. To appreciate his position, we must remember something of the unquestioning faith in bleeding and blistering, purging and physicking, which was still held when Gull was a student. . . .

"He once said to the present writer, after his retirement from practice, 'One thing I am thankful Jenner and I have together succeeded in doing. We have disabused the public of the belief that doctoring consists in drenching them with nauseous drugs.' Nevertheless, those who knew Gull's practice, either in the hospital or in private, are well aware that his scepticism was perfectly reasonable, and his therapeutical faith all the stronger because it was discriminating.

"He often did not do himself justice. His paper on the treatment of rheumatic fever was headed 'Cases of Acute Rheumatism treated by Mint Water.' But really his treatment of this disorder was most thorough and efficient. He had the patient's bed screened from the rest of the ward, his friends were not allowed to visit him, he was not suffered to be moved, and no examination of the heart was made beyond what could be carried out without disturbing him. He was put on low diet, with plenty of barley water to drink, the inflamed joints were carefully wrapped in cotton wool and protected with cradles, and he always had enough opium at night to secure sleep and prevent painful startings of the limbs."

He never hesitated to prescribe the medicines of which the effects had been proved by facts well observed; but he

endeavoured, above all things, to study the natural history of disease, uncomplicated by the action of unnecessary drugs, and he resented all useless interference with the course of nature. He would say of meddling poly-pharmacy—

“Fools rush in, where angels fear to tread.”

His treatment of disease on rational principles rather than by drugs did not always meet with grateful recognition. A patient who had passed successfully through a severe attack of typhoid fever without medicine, in Guy's Hospital, was congratulated by Dr. Gull on his recovery. “Yes,” replied the man, “and no thanks to you either.”

He sought to teach his students not to think they could *cure* disease. “The best of all remedies,” he would say, “is a warm bed.” “I can tell you something of how you get ill, but I cannot tell you how you get well.” “Healing is accomplished

‘By an operation more divine
Than tongue or pen can give expression to.’”

“Remedies act best when there is a tendency to get well.”

Sir William, it has been well said, “has left the mark of his impressive thought on the medicine of our day, and has moulded the shape of our theories, conclusions, and practice, to an extent which can only be measured by a wide survey and a subtle insight into the changes which, during the last forty years, have altered the whole character of our medical faith.”

He held that the highest work of a physician should be rather the *prevention* than the cure of disease; and the wide scope of preventive medicine, with all its possibilities for the future, was a subject that profoundly interested him. He writes:—

¹“As health is our object, or as near an approach to it as circumstances admit, *hygiene* and *therapeutics* claim the last and highest place in our thoughts. Happily, at this day, hygiene has gained strength enough to maintain an independent position as a science. To know and counteract

¹ ‘Medicine in Modern Times.’

the cause of diseases before they become effective is evidently the triumph of our art ; but it will be long before mankind will be wise enough to accept the aid we could give in this direction. Ignorance of the laws of health and intemperance of all kinds are too powerful for us. Still we shall continue to wage an undying crusade, and truly we may congratulate ourselves that no crusade ever called forth more able and devoted warriors than are thus engaged.

" Nothing can stimulate science more to the investigation of therapeutics than the feeling that the diseases calling for treatment prevail in spite of our best efforts to prevent them. Where hygiene fails, properly commences the work of therapeutics ; but it is painful to find ourselves occupied in making feeble and often useless efforts to combat the effects of a poison which might perhaps have been stamped out in its beginnings."

And again, ¹" Medicine yet owes it to society to demonstrate more fully those secondary conditions whereby a healthy mental activity may be secured and advanced ; for of nothing can we be more certain than that the laws of life, in their unimpeded operation, culminate in the advancing perfection of man—corporeally, intellectually, and morally. But the operation of these laws depends upon common things. Whilst the ignorant have recourse to the supernatural, science asserts that everything, if not traced, is yet traceable to its antecedents ; and thus, as the handmaid of religion, proves that what a man soweth, that shall he also reap."

At a meeting of the Charity Organisation Society, for promoting the establishment of Provident Dispensaries, at which he spoke, he emphasised the importance of disabusing the poor of their belief in drugs, and of inculcating upon them cleanly habits and healthy ways. " There is a belief," he said, " amongst the poor that disease comes by Providence and is cured by drugs ;" adding, " whilst you put up a public house at one end of your street and a provident dispensary at the other, how can you expect your people to be healthy ? "

Notwithstanding the pressure of Sir William's private

¹ ' Harveian Oration . '

and public work, he found time to continue his investigations into the causes and nature of disease. His scientific papers, lectures, and addresses, will hold their place in medical literature, for they relate to one of the most important epochs in the whole history of medicine. As these papers were published last year by this Society it is not necessary to enumerate them here. One of his earliest and most important works was his report upon Cholera made conjointly with Dr. Baly for the College of Physicians in 1849. Special mention should also be made of his paper on "A Cretinoid Condition in Adult Women," almost the last he wrote. It bears evidence of the keenness of his perception, and the accuracy of his pathological views, expressed about a not uncommon disease which had hitherto escaped notice. ¹ "It is remarkable," writes one of his colleagues, "that a disease which no one had recognised before its existence and characters were established by Gull, has since been found to exist not only in this country and on the Continent, but in America and Australia. Moreover, he not only caught its characteristic *facies*, and recognised its importance, but in the name under which he described it, he indicated its true pathological relations, doubtful and obscure for some time, but by recent investigation established beyond all reasonable doubt."

It is also interesting to note that ¹ "long before Wunderlich had shown the characteristic curves of temperature in fever Gull had learnt the pathological lesson now everywhere recognised, that fever is a process, with a beginning, an ingravescent stage, an acme, and a gradual subsidence. He used to enforce this doctrine in his lectures by drawing curves on the blackboard,—a long, gentle, and irregular one for typhoid fever, a shorter, more abrupt, and more regular curve for typhus and for scarlet fever."

"On the whole," the same writer adds, "it may be said that scarcely any living physician has made so many, so important, and so varied original observations."

Sir William fully appreciated the importance of the collective investigation of disease, and did what he could to advance this branch of medical study. He writes:

¹ 'Guy's Hospital Reports.'

¹ "Man individually is but a unit in a large account, a living atom in the great body of human social life, and so to study him is a subject demanding our thought and work. By looking at large numbers, facts before unnoticeable become proportionably magnified. Causes affecting health and shortening life may be inappreciable in the individual, but sufficiently obvious when their effect is multiplied a thousandfold. If the conditions of society render us liable to many diseases, they in return enable us to establish the general laws of life and health, a knowledge of which soon becomes a distributive blessing."

In 1884 he attended the Medical Congress at Copenhagen as representative of the International Society for the Collective Investigation of Disease. The following quotation, taken from his address on this occasion, shows the gain he anticipated from this method of combined study.

"In an international collective investigation the ground widens very much, not only from the different intellectual characters of its working members, but also from the greater variety under which disease presents itself.

"The first gain, no doubt, will be from the intercourse and reaction of different national modes of thought with and upon each other. It need not be said that the ways in which any subject may be viewed do not depend upon the subject itself, but upon the varied capacity of the minds brought into relation to it. Minds evolved during ages under special local and national conditions, and educated in lines of their own, cannot fail to give new direction and shape to the questions proposed for solution.

"Each national mind will feel a different mental necessity. . . . Each nationality produces its own scientific school, and not least in respect of the science of medicine. One nationality is more distinguished by its powers of analysis, another by its power of synthesis; one is critical, another historical; one characteristically anatomical, another physiological. Even if this occurred to only a limited degree there must follow an interchange and fertilisation of ideas. And let no one believe that this is a dream. We have reached no more than the threshold of intellectual evolution."

¹ 'Study of Medicine.'

He was one of the chief promoters of the Association for the Advancement of Medicine by Research, and it is with the view of helping forward this important work, in which he took so great an interest, that his son, Sir Cameron Gull, has founded a scholarship at Guy's Hospital, bearing his name.

He took an active part in the controversy on vivisection, and his evidence before the House of Lords was important and judicial. In an article on this subject, written for the 'Nineteenth Century,' he sums up his convictions. "There is no doubt that physiological experiments are useful, useful for animals as well as for man; . . . they are therefore justifiable. . . . To the accusation of cruelty, physiologists may fairly reply, supported by all past experience, that there is nothing so cruel as ignorance."

Believing as he did that good nursing was one of the most important factors in recovery from sickness, Sir William took deep interest in every effort to promote the better training and welfare of nurses. He warmly supported the change at Guy's from the old *régime* of nursing to the new, although he deeply regretted the conflict of opinion with some of his colleagues into which his action in this matter brought him. He fully appreciated the arduous duties of a nurse, and held in honour those who from high motives devoted their lives to this humane work. "Nursing," he said, "has sometimes been made a trade, sometimes a profession; it will never be what it should be until it is made a religion."

He never would adopt a course because it was popular, unless at the same time he believed it to be right. His courage was equal to his sense of duty. On the occasion of his receiving the LL.D. degree at Cambridge, when, owing to the evidence which he had recently given upon the trial of a nurse, charged, as he believed unjustly, with manslaughter, he was received with hisses and groans, he refused to allow the Vice-Chancellor to put a stop to the uproar, and stood calmly until it had subsided. He said afterwards he felt it to be the greatest honour that had ever been done him, and however unpopular at the moment, he never doubted that the attitude he had assumed at the trial was right.

At all times he endeavoured to raise the standard of his

profession,—moral, scientific, and social. "There is," he writes, "probably no human work which daily confers greater good upon society than does ours; and when we consider that from the ranks of our profession the chief cultivators of modern science have sprung, whether we speak of botany, hygiene, or social science, we may feel justifiable pride, and be encouraged, in spite of all failures, to go on, assured that our future must be one of ever-increasing usefulness and honour."

Sir William Gull took an important part in the public work of his day. From 1856 to 1889 he served on the Senate of the University of London. He was the first medical graduate nominated to fill that position. His success in its examinations had added largely to the reputation which secured his early advancement at Guy's, and by his later successes he could be counted among the first of those by whose career the value of the M.D. degree would be illustrated.

From 1871 to 1883 he represented the Crown, and from 1886 to 1887 he represented the University of London on the General Medical Council. It has been said that "in administrative questions he did not lend himself to details as he did in all his clinical work;" but his judgment was sound, and his influence always in favour of advance and improvement. He was not a frequent speaker, but when he spoke his words were always to the purpose, "he was listened to with attention and his opinion carried great weight."

In 1871 and 1872 he was President of the Clinical Society. Among other public works, the part he took in the promotion of the scheme for the Brown Institute should not be forgotten. No one foresaw more clearly than he the value of Comparative Pathology, or realised more fully the gain to man of enlarging the confines of the study of medicine from the narrow limits of the sick chamber, or post-mortem room, to the study of all living things.

Dr. Gull was appointed Assistant Physician to Guy's Hospital in 1851. In 1858 he became full Physician, and having retired from his work at the Hospital in 1868, he was in 1871 made Consulting Physician. He was appointed

Lecturer on Medicine at Guy's in 1856, together with Dr. Owen Rees, and he held this post until 1867.

In 1858 he was elected a Fellow of the Royal Society, and was for many years a member of the Council. He received the honorary degree of D.C.L. of Oxon. in 1868; of LL.D. of Cambridge in 1880; of LL.D. of Edinburgh in 1884, and in 1872 he was created a baronet, in recognition of his services during the severe illness of H.R.H. the Prince of Wales in 1871. He was at the same time appointed Physician to the Prince of Wales, and subsequently Physician Extraordinary, and latterly Physician in Ordinary to Her Majesty, Queen Victoria.

¹ "Few men have practised a lucrative profession with less eagerness to grasp at its pecuniary rewards. He kept up the honourable standard of generosity to poor patients, which has been handed down from Mead and Heberden; and with a liberality which is less common, he showed no jealousy of younger men sharing in his good fortune. Not one, but five or six of those who were rising in the profession, owed much of their success to his help."

This short memoir is written, not as a review or criticism of the professional works of their author, but rather as a sketch of the personal character of the man who wrote them, and who occupied for full forty years an important place in the eyes of the Public, of men of Science, and of members of the Medical profession. Few men of eminence have during their lifetime been more freely criticised. This arose partly from the novelty of some of his opinions, and partly from a certain prejudice against his somewhat imperious manner, and his seeming dogmatism in regard to his scientific inquiries and his therapeutical conclusions.

But here this account of his professional life must cease, adding once more that he seemed in all the varied circumstances in which he was placed, as a man of science or as a physician, to be endued with a strange power and a strong will; he strove his best, according to his belief, from his childhood to his grave.

¹ 'Proceedings of the Royal Society,' Obituary Notice.

III. CHARACTER AND DAILY LIFE.

THE love of his early days continued with Sir William all through life. He never wearied of recalling their happy memories. His deep affection for his mother, his admiration of her character, and his love for the simple life and pursuits of his childhood's home, remained always unchanged.

His admiring wonder of the works of Nature, first excited as he studied the lowest forms of life in the water-butt in his mother's garden, in his wanderings by the sea-shore, or, in the various creatures dredged up, on the many expeditions in his father's boats, continued undiminished throughout his long and active career, and was a constant source of relaxation to him from his professional work. Even the marvel of a tadpole was always fresh, teaching new lessons and opening out new avenues of thought.

In London the sparrows were his teachers and his friends. He would watch their habits and ways with the greatest interest, and would note their respective positions when roosting, deducing from the similarity of these night by night, and the quarrelling that took place over the settlement, the probable fact that each sparrow had its own particular resting place.

For every subject of interest he had a ready quotation, and he would add after contemplation of his little friends, Shakespeare's words :

"There's a special providence in the fall of a sparrow."

His early rambles in the pursuit of botany over the hills at Lewes, under the helpful guidance of Mr. Joseph Woods, were recalled again and again, and in passing by train he would often point out the old favourite haunts.

His love of nature was intense—it was an entire *devotion*. On his holidays there was hardly a walk but some insect or plant was brought home for observation, study, and reflection.

In the daily rambles, being struck by some beauty of nature, he would return day after day to the same spot. A memorable tuft of heather, a mass of bloom, was thus visited by him for more than a week. "The 'burning bush'—burning with life," he said, as he stood before it in silent wonder and contemplation.

A wayside flower, a coloured moss, a tiny insect, would move him to the depth of his being.

"To me the meanest flower that blows can give
Thoughts that do often lie too deep for tears."

was to him a reality, and not a mere form of words.

During his last illness he would drive considerable distances to see or gather some favourite flower or plant; thus the great horned poppy, the "wayfarers'" tree, or a patch of sea-kale growing on the shore near Eastbourne, was the goal of many an afternoon's excursion.

Nature was truly to him the revelation of God. He was never tired of studying, observing, humbly admiring, almost worshipping, any living thing. He writes, "What bright and convincing lessons of theology might man (would he but open his eyes) read in his own person—that microcosm of divine art, where, as in the sentence of a divine epitome he might trace in every lineament or member, the finger and authorship of the Godhead!"

He would quote from Newton: "The main business of natural philosophy is to argue from phenomena without feigning hypotheses, and to deduce causes from effects, till we come to the *very first cause, which certainly is not mechanical.*" And again from Milton:

"Oh, Adam! One almighty is, from whom
All things proceed, and up to Him return,
If not depraved from good; created all
Such to perfection, *one first matter all.*"

The former passage, marked in his copy of the "Treatise on Optics" many years before, seemed to impress itself more and more upon him, and was frequently on his lips during the last year or two of his life.

In the contemplation of the perfection of God's work and power in nature the attitude of his mind was the humblest and most reverent; "I am but a child, I know nothing," he would say as he turned from some fresh revelation of wonder or beauty; and he would add, "Except ye become as little children." He often repeated Chaucer's words,

"For every mortal mannes power nys
But lyk a bladder ful of wynd, i-wis;
For with a nedeles poynt, whan it is blowe,
May al the bost¹ of it be layd ful lowe."

His love of nature extended to all created things. The study of the nervous system of a caterpillar or slug stirred in him the deepest admiration. "O all ye works of the Lord, bless ye the Lord,"—"but," he added, "your Benedicite is too narrow; we must put in 'all ye caterpillars and slugs,—all ye creeping things,—bless ye the Lord.'"

"He prayeth best who loveth best
All things both great and small;
For the dear God who loveth us,
He made and loveth all."

Sir William had an immense capacity for work, and the love of it for its own sake was a remarkable trait in his character. He insisted that work is an *essential condition* of life; the advantage of wealth, he would say, was not that it excused a man from the necessity of work, but that it left him free to choose what should be its direction and its aim.

On one occasion a young lady of high position being brought to him for advice, he said to her, "you must earn your own living and then you will be well!"

"True happiness," he would say, "consists in the exercise of the faculties upon their proper objects."

He had a great dislike to the word *pastime*; all amusements, he contended, should be for *re-creation*. A frequently repeated maxim was that "rest is change of employment and thought, not cessation."

One of his favourite poems, and one most often quoted,

¹ Boast.

was George Herbert's 'Elixir,' "FOR THY SAKE." This, he held, gave to work its true dignity, its object, and its purpose.

"This is the famous stone
That turneth all to gold

.

A servant with this clause
Makes drudgery divine;
Who sweeps a room as for Thy laws
Makes that and the action fine."

Many were the quotations on this favourite subject, gathered from all sources, with which his mind was stored. Of these the following may be instanced:

"In earthly races
To victors only, do the heralds call,
But oh! in yonder high and heavenly places
Success is nothing, *and the work is all.*"

"God gave thy soul brave wings; put not those feathers
Into a bed, to sleep out all ill weathers."

"Oh that I were an orange tree—
That busy plant!
Then should I ever laden be,
And never want
Some fruit for him that dresseth me."

In figure Sir William Gull was of medium height, and squarely built, of great strength and vigour, and endowed with a power of physical endurance such as alone could have enabled him to do the vast amount of work which he successfully carried out during all his professional life. His voice was sympathetic and impressive, his utterance measured and forcible, and at times startlingly abrupt. In face, form, and manner it was frequently said that he resembled the first Napoleon.

In conversation he was brilliant, and his stories and his aphorisms must dwell in the minds of many.

His love of argument was great, and he would often play the part of *advocatus diaboli* for the sake of indulging in it.

One of his contemporaries writes, "He had not exactly a vein of pure humour, for his humour was generally critical and sometimes sarcastic, but he would speak of the

whims and fancies of men in terms of material pathology, with a cheery satire quite inimitable, and with a depth of sympathy, and a force pathetic and startling. Hence, in part, his power over his fellows; for these qualities were lavishly poured forth on any subject which seemed to him open to it, and especially on all that he thought to be unreal, or false, or hypocritical, whether it occurred in religion, in politics, or in his profession."

Those who may have heard him quote Thackeray's withering satire on George the Fourth will never forget it. "Under waistcoats,—more under waistcoats, and then—nothing." He would say, "That which makes the man is the manhood." "A man must be greater than his surroundings."

Brilliant and epigrammatic as he was in his speech, the work of expressing himself in writing was one of great difficulty to him. He would labour long over the construction of a single sentence, and his lectures and addresses were accomplished by sheer hard work. He sometimes paced the room for hours together seeking to find expression in words for the thoughts of which his mind was full.

He possessed a remarkable power of concentration, and at the same time a no less remarkable versatility of mind. He could at a moment's notice throw aside all thought of work or anxiety and return to some quotation or argument, dropped it might be some hours, or even the night before, taking it up exactly where he had left it. In the same way his mind would recur at intervals of cessation of work during the day, to some main thought which was engaging it.

He was gifted with the power of almost instantaneous repose and sleep. He could sleep anywhere and at any time. During his hard professional work he constantly slept for ten hours at night, and he considered that no one should have less than eight hours' sleep.

He was never in a hurry, always deliberate, and in the middle of the busiest morning would find leisure to converse with a friend on some topic of general interest. He often made use of Mr. Gladstone's words: "If you want leisure you must make it."

His bodily strength and vigour were associated with an equal power of mind and independence of character.

Having once formed an opinion, or determined upon a line of action, he carried it out unhesitatingly, uninfluenced by any thought of consequences. He was unswerving in his ideas of right and wrong, uninfluenced by other people's views and opinions.

He would not express any judgment unless he believed himself certain of his data, and knew his conclusions to be correctly drawn from them. It followed as a consequence that he despised, and sometimes showed that he despised, careless conclusions from inadequate data, on professional or any other subjects.

His insight into truths which lesser minds were blind to see and powerless to grasp, and a lifelong experience that his vast capacities generally placed him in the truest relation to things, developed in him an absolute confidence in the infallibility of his own judgment on certain points. This led him at times to an intensely dogmatic expression of his own views, which not unfrequently provoked antagonism and gave offence, when none was intended, to those who did not know him well.

From self-assertion, properly so-called, he was entirely free, his whole life being characterised by a remarkable simplicity, and absence of ostentation.

He had a great intolerance of forms, "etiquettes," and private considerations, when standing in the way of what he considered right and truth.

The sharp, clever spirit of mere wordly wisdom, all that was mean, paltry, sordid, self-seeking, found no countenance from him.

Of all evils, he looked upon *ignorance* as one of the worst. He often said, "There is nothing so cruel as ignorance." "The devil has been painted in many ways; I should like to paint an *ignorant* devil." He desired to portray in so forcible a manner as to command attention, that spirit of ignorance and prejudice, to which so much preventable suffering and disease may be referred, whether by the neglect of God's laws of health and conduct, or by hindering the investigations of science for humane purposes.

"The breaking of God's laws, moral and physical," he would say, "of necessity brings its own punishment;" "the intellect of man in operation is *the providence of God*;" "I would gladly leave off attending *disease* to teach people how to live."

Sir William was gifted with a strong power of sympathy with suffering in every form, but more especially was this the case when the sufferer belonged to one of three classes—the young, the aged, or the sick; these, he said, must always be helped.

He had many poor people among his patients to the last. Late one night, on returning tired from a long journey, the cabman, on receipt of his fare, still held out his hand with the money in it, hesitated, and said, "But could you give me something for my cough?" The man was taken into the house, prescribed for, and sent away happy. Another time, on arriving in London in the early hours of the morning, a cabman refused to take him. "I want luggage," said the man, who doubtless had been waiting long for his fare. "All right," said Sir William, "I will be your luggage."

When absent on his holidays, a little child, a sick mother, a suffering man, would be gladly attended, and receive the best advice he could give; but if asked to visit some wealthy or fashionable person, the answer was invariably a refusal. "On my holiday," said Sir William, "I cease to be a *doctor*, but I do not cease to be a *man*." "I am willing to be a good Samaritan, but only on a like emergency."

It will appear over and over again, that with all the detailed knowledge and determined grasp of things material with which Sir William had to do, whether anatomical or biological, normal or abnormal, there lay a hidden fire beneath, which broke out unexpectedly in some quaint way, and showed itself as a yearning for a spiritual light which might enlighten all things visible and invisible.

"Man's life," he would say, "is as a pyramid; the base material, the middle mental, the top and crown of all spiritual." He loved to dwell on the transformation of material into spiritual; the grass into the sheep, the sheep

into the man, adding, according to his usual habit, a favourite quotation,

"Tasting concoct, digest, assimilate,
And corporeal to incorporeal turn."

"Till body up to spirit turn."¹

In his Scottish home he would (inverting Homer's simile, perhaps unconsciously, *οἷη περ φύλλων γενεή, τοίη δὲ μὰι ἀνδρῶν*) watch the leaves as they fell, likening them to the generations of men succeeding one another, flourishing, falling, forgotten, whose places are filled by another generation, flourishing and going in their turn, the tree itself remaining as the principle of life, just as God's world lives on, though the units come and go.

So in the most ordinary human affairs he coupled the warm love of material nature with the inner spirit, which to him was the real life.

A plant growing in a pond in his garden supplied reflection for weeks—a parable, he said, of man's life, of the Pattern Life. Its shapeless growth beneath the water,—the change of form,—the flower on coming to the surface. He got a friend to draw this, and himself put in the words, "No form nor comeliness—hope,—fulfilment." Afterwards he got the same friend to add to the drawing the grub of a dragon-fly, and the dragon-fly itself, with the words,

"To-day I saw the dragon-fly
Come from the wells where he did lie,
An inner impulse rent the veil,
Of his old husk, from head to tail
Came out clear plates of sapphire mail.
He dried his wings, like gauze they grew;
Through crops and pastures wet with dew,
A living flash of light he flew."

To a friend in trouble he presented a drawing of a winter rose under which was written, "In tenebris lux."

To a little child who had nearly died of diphtheria he gave a spoon on which was engraved, "Who healeth all thy diseases, who redeemeth thy life from destruction."

¹ Cf. "And from those corporal nutriments perhaps
Your bodies may at last turn all to spirit."

Milton's *Paradise Lost*, Book x.

The drawing of a spray of holly and holly berries, arranged by him in the form of a cross, bears the words "Spinæ et sanguis."

Upon his bread platter he had engraved "Man shall not live by bread alone."

He would quote,

"But as birds drink, and straight lift up their head,
So must he sip and think
Of better drink
He may attain to after he is dead."

This habit of regarding the spiritual through the material, was for him beautifully expressed by George Herbert, in words of which he never tired,

"The man that looks on glass
On it may stay his eye;
Or if he pleaseth through it pass
And then the heaven espy."

Books were his life companions and friends; he was not an "omnivorous" reader, but his range of literature was wide. His favourite poets were George Herbert, Shakespeare, Schiller, Dante, Spenser, Chaucer, and Burns. On his long country journeys one or other of these was constantly his companion, and those who knew him will recollect his pleasure in capping some passing event, some point in the conversation or discussion, with a favourite quotation.

First and nearest, all through his life, must be placed, as has been said above, George Herbert. He had a ring engraved for himself, bearing the design of one given to George Herbert by Dr. Donne—a crucifix in the form of an anchor,—with the words written on the paper in which this ring was found wrapped, after George Herbert's death, "Crux ancora mihi." This he always wore.

Shakespeare he read at all times. Though he sometimes quoted Goethe, yet his mode of thought and feeling were not congenial to him, and after some years he was rejected. Schiller he studied much. One year in Scotland he beautifully translated his "Sehnsucht," which

fully expressed his own unsatisfied and unsatisfiable mind. He would stand day after day and look up to the Scottish hills, and say the same words :

“ Und die Luft auf jene Höhe
O wie lebend muss sie sein.”

He learned Italian from an Italian Bible which was given him when he first came to London, and during his convalescence from typhoid fever, the only serious illness he had until his final attack, he set himself to study Dante. In him he found the climax of truth and beauty, and he was never without the great Italian's works during the later years of his life. He always read it in the original. He had a true veneration for Dante,—“My Dante,” “my personal friend,” he called him,—and fulfilled in his untiring zest for his works one of his favourite quotations :

“ E duopo il festa più fiamme
Che pria.”

He read Tennyson with attention, but not with full satisfaction, though he often quoted some of his poems. His copies of Spenser and Chaucer were marked in every part. Milton's “Paradise Lost,” as also some of his minor poems, were read and admired. Burns appealed to him for his love of nature.

Amongst prose writers of the day he read Thackeray and Dickens with pleasure. He was not in sympathy with Carlyle. But here I must pause, though not without a word of his study of Hooker, of Jeremy Taylor, and to some extent of St. Augustine and St. Thomas Aquinas.

The books he cared for were never merely read, they were studied, pondered over, digested, absorbed, until the mind of the author became as it were a part of his own. Passages which impressed him were marked, committed to memory, and once learnt were never forgotten. He would work at one book for a year or more, making it a constant companion, recurring to, and quoting again and again some favourite passage. He would often ponder over one sentence or verse for a whole evening.

He always rose at 8, but for many years it was his custom not to breakfast till 9.15, and this quiet time he

would spend in studying one of his favourite authors or in occupying himself with his own thoughts, writing down in a few words the subject or the outcome of these meditations.

His mind was clear to the last, and his love for his books and quotations, so characteristic of himself, remained with him to the end. The following was one of his latest quotations, often repeated during his fatal illness :

“ His words breathe truth, who breathes his words in pain.”

This brief sketch of Sir William's daily life would be incomplete without a word concerning his friends, his manner of taking or making a holiday, and his religious beliefs.

He did not form numerous friendships, but those he did were deep and lasting.

His gratitude and affection for Benjamin Harrison, to whose help he owed his career at Guy's, remained unchanged to the end of his life.

His early associations with Frederick Denison Maurice, the much loved Chaplain of Guy's Hospital, influenced, it may be believed, his whole life. Maurice was, as all acquainted with the history of the “Oxford Movement” know, a spiritual force little congenial to many; beloved, almost adored, by some. For the life and history of Maurice this is not the place; but Gull was from the first attracted by his saintliness, his intellectual grasp, his tenderness for the sick and suffering, and his sympathy with the medical students. By Maurice, or with him, it cannot be doubted that Gull's devotion was turned to Shakespeare, Milton, George Herbert, and to all the greatest English thinkers.

His intimacy with Michael Faraday, formed when first lecturing at the Royal Institution, continued close and uninterrupted until Faraday's death in 1867. His simple life, his humble, childlike spirit, and his deep scientific insight, found sympathetic response in Gull's own nature.

Of the friendships of his later life it is not possible to speak, but the names of Sir Henry Acland, Sir William Jenner, Sir James Paget, Dr. Weber, Dr. Matthews Duncan, and Lord Justice Lindley cannot pass unmen-

tioned. Of friendship he would say, "To know a person you must *believe in him*."

"The friends thou hast and their adoption tried,
Grapple them to thy soul with hoops of steel."

In the earlier part of his life his holidays were mostly spent abroad. Although his greatest delight was ever in nature, he would study with profound interest cathedrals, buildings, pictures, works of art, in all the places he visited. These as setting forth the workings of man's mind filled him with admiration; and long letters to children and friends, full not only of descriptions of these things, but of the many thoughts they suggested to his ever-fruitful mind, bear record of the minuteness with which all were studied.

He admired the grandeur of Alpine scenery, but the "chaotic" aspect of nature was never wholly congenial to him. A ploughed field, a richly cultivated land, as betokening the operation of man's intellect, always afforded him more pleasure than a waste of uncultivated country, however beautiful.

In later years his holidays were almost entirely passed amongst the Scotch mountains. Here he would give himself to the repose and rest which the contemplation and study of nature and his friendly books afforded, surrounded only by his own family and the many young people he gathered about him. One or other was always a welcomed companion of his rambles, and it was his delight to make them share his pursuits and thoughts, opening to them some loved secret of nature, training their eyes to see something not seen before, storing their minds with some noble or beautiful thought, drawn from one of the authors dear to him, or clothed in his own epigrammatic language. His personal influence was great, and many will look back to those days and feel that they owe to them much of truer views and higher aims. As he would say :

"We live *by admiration, hope, and love* ;
And e'en as these are well and wisely fixed,
In dignity of being *we ascend*."

He frequently carried a gun, but cared only for sport as

giving an object for walking over the hills he loved, and keeping him in the fresh air; the size of his "bag" was nothing to him. It gave him more pleasure to watch unobserved the natural habits of an animal than to kill it.

During these intervals of leisure both his microscope and telescope were a source of interest and instruction to himself and to those about him. He studied the heavens with no less delight than the earth, and he found pleasure in wandering alone in the dark.

These later resting times of his busy life, spent among the Scottish mountains, in the contemplation of quiet and lovely country scenes, among a sturdy and independent people, recalled happily the simple joys and associations of his early years, when the growth of a single flower filled him with a yearning desire to know the whence, the whither, and the how, of every plant or animal form that had life.

It would be out of place in this sketch of Sir William's personal, as distinguished from his professional life, to pass any judgment on the character of his religious opinions in these days of precise criticism. In the notice of his earliest years the teaching and character of his much-loved mother is shortly described. She never questioned the doctrine of that branch of the Church of Christ in which she had been educated. She observed its ordinances from love and duty. She did not discuss its formularies, and what she believed, she taught. Her son lived in the glare of clashing dogmas. He was not the slave of any. He observed the ordinances of the Church wherein he was born; and his teacher was his Bible.

"I do not believe less than you," Sir William said one day to a friend, "I believe more;" adding, "In Him we live and move and have our being." But forms, ceremonies, and dogmas were never greatly in harmony with his mind.

This memoir will have been of little worth if it has not shown the solemnity that filled Sir William's mind on the contemplation of all things visible and invisible, material or spiritual, in all the varying conditions in which man is placed.

He would often say, "Belief is necessary to the highest knowledge," and would quote from Spenser :

"Oh, why should witless man so much misween
That nothing is but that which he hath seen?"

He recognised the limits of knowledge, and would frequently repeat St. Augustine's words: "There are some things we must *know* in order to believe them, and there are others we must *believe* in order to know them."

Sir William's was a deeply reverent mind; the following touching passage from the "*Religio Medici*" frequently referred to by him, accorded well with his feelings:

"At the sight of a cross or crucifix I can dispense with my hat, but scarce with the thought or memory of my Saviour. . . . I never can hear an Ave Maria bell without an elevation; or think it a sufficient warrant, because they erred in one circumstance, for me to err in all,—that is, in silence and dumb contempt. Whilst, therefore, they directed their devotions to her, I offered mine to God, and rectified the errors of their prayers by rightly ordering mine own."

Lastly, the motto engraven on his seal, for long elaborated, allowing as it doubtless does of much discussion, and of widely differing interpretations, represented to his own mind what he conceived to be the relation of man to himself, to science, and to God.

"Conceptio Dei,
Ratio rei,
Negatio mei."

It was during his holiday in Scotland amid the scenes so congenial to him, that in October, 1887, he was struck down by paralysis, from which he never wholly recovered. In a few weeks he was moved to London. The end did not come until January, 1890, when a fresh and acute illness brought to a rapid close the strong life here too feebly portrayed.

IV. NOTES AND APHORISMS.

THE following part of this sketch is taken entirely from notes jotted upon scraps of paper which were found in Sir William's study after his death.

It is to be regretted that the pregnant and startling remarks habitual to him of which we have record, paradoxical as they are, should not be more numerous. That the habit of writing down his thoughts was not formed early in life is a loss alike for his portraiture, and for the thought of our time.

Of these fragments it has been possible to print only a few, the greater number being obviously incomplete. They illustrate the fulness of Sir William's active mind in the intervals of his intensely practical life. Some were probably written after chance conversation with other serious thinkers, on the nature of things, on the ignorance and on the knowledge of man, and on the relation of man to God. Others formed the subject of well-remembered conversations with those around him. Many were evidently the outcome of reading Dante and George Herbert, or some other of these great teachers of man who were his chief delight, outside and beyond his profession. Would that these notes were more in number and more full in detail! They tell, however, how he lived in habitual touch with the deepest questions of modern thought. They are given as they stand, without comment, as the thoughts of a deep writer and thinker, during an overworked practical life.

The world is not my proposition of it (*nicht meine Vorstellung*), but *my* world is my proposition of it (*ist meine Vorstellung*).

My world is that part of it to which my sense extends. My eye reaches to the stars; my ears to the thunder in the sky, or to the vibrating vocal chords of the lark which sings there. My nose goes into the petals of the rose by continuity of the perfume which exhales from them; or into the joint which gives out its appetising smell in the roasting. My taste reaches into the textures brought into contact with it as the touch continues on beyond its immediate self in the tension of a cord or the extension of a rod.

Not only are the senses related to the world, but they recognise themselves as such; the light seen is in the direction of my seeing it, the hearing is the object producing the sound. It is true one sense may need another for its assurance in all points, but with this mutual criticism they mostly prove right. The sense is limited to its proper lines of operation, but, this admitted, it may truly be said that the eye as much touches the most distant star as that my fingers touch the pen with which I write.

The world is to me my proposition of it; and so is the pig's world, the pig's proposition of it; or, to use a common saying, "the pig sees with pig's eyes;" but that the world is more than my proposition of it is proved by the fact that the pig's world is not mine, nor is mine that of a more highly instructed man, of one who has a larger mental capacity, and who is more widely and more intimately acquainted with the workings of nature, inorganic and organic. Newton's and Darwin's world were different from the worlds of most men, and yet their worlds were not *the world*, but more and better than mine, as they had followed out further and better the teachings of the sense. The world is more than anyone's proposition of it, or, if you please, say conception of it, though to repeat, any man's proposition and conception of it, is *his* world. Not to name the systems of individuals it may, without doubt and with all respect, be said of them, such is Mr. A—'s world; this is Professor B—'s world, and so on, to the end of the alphabet. All are worthy of consideration; all exhibit the mental state of the individual who puts his system forth; all are (if he be not a madman) in some relation to *THE* world. Newton, in a wider

sense than the village agnostic, who denies because he is ignorant, and is satisfied he knows all because he knows so little.

What is scientific knowledge? What is demonstrable to the sciences? How demonstrable? By repetition at will of the conditions. Gravitation is demonstrable by leaving a body unsupported. Heat is demonstrated by its effect on bodies, dilating them as in a thermometer of air, spirit, mercury, or a bar of metal. Light is demonstrable by lenses and chemical effects, and by the retina of animals. Electricity is demonstrable by the repulsion of light bodies from each other, by its inducing a magnetic state in copper. By these and numerous other modes, physical powers are demonstrated to be quiescent and active about us. But if we go a step further and inquire into higher combinations, as is open to us, in the leaf of a tree or a blade of grass, and pursue the inquiry, another world of powers is gradually revealed.

I cannot admit that any near approach has been made to an explanation of our moral and intellectual nature, of that which we call and feel to be ourselves.

It may please and satisfy some students of nature to think they know more than others, and that from analogy and logic they are able to unravel it, to the last thread of our textures, and then to sit down and contemplate the simplicity of the organism with its fears and aspirations. Such a spectacle but exhibits the simplicity of the student and the shallowness of his inquiry. This will hardly be considered too severe a criticism if it be admitted that we know nothing of the evolution of sense.

"Ergo vivida vis animi pervicit

. Religio pedibus subjecta vicissim
Opteritur, nos exaequat victoria caelo."—*Lucretius*.

"Religio" is here used for the objects of it, not for the aspect of the mind to holy things. The two uses of the word must be carefully dissevered in our language.

Man has been a great loser by not bearing in mind this distinction.

“It is the shrine which thou dost venerate,
And not the beast that bears it on his back.”

The right and duty of man to look into the things of which he forms part, and upon which his very existence depends, is now fully admitted.

This right and duty requires, however, a profound sense of the unfitness of untrained minds and unarmed hands for the work.

Reverence, and even a deep reverence for ourselves and our work is needed, or we may easily find ourselves putting ourselves forward and explaining Nature when we should be patiently and diligently investigating her ways.

It plainly appears that the same questions which we now ask ourselves to-day have been asked over and over again for thousands of years past.

When we come into the presence of great writers and teachers we should remember that they have more to teach than we have capacity to take in, however docile we may be.

If this is true of men, of the prophets and teachers of Nature's truths, how much more of Nature herself, whose ministers they are !

The laws of things as we know them, their constancy in the midst of continual change, their invariability and so far permanence, do not, however, carry us further than themselves, not to that of which they are the expression and form.

“Diese Gesetze nicht unsere Leitfaden sein können.” (These laws cannot be our guide.) Schopenhauer regards the platonic and *vera* explanation of eternal laws as dreams.

We must go deeper into ourselves if we would be acquainted with the reality of our being.

It is not even what we do or what we think ; these states are proximate, striving, therefore changeable, and good or bad in their relation to the subject, or not at all, but even the true and best are not the subject.

“Der Welt Ende und Anfang nicht ausser uns, sondern in uns zu suchen sei.” (The end and the beginning of the world is not to be looked for outside us, but in us.)

What we are, such is our world.

We have no faculties for passing beyond ourselves, yet in ourselves are unfathomed depths, unexplored powers and relations which need fathoming and searching into. As Schopenhauer says, if we would understand nature our course must not only be horizontal, but perpendicular.

And though, as he says, the brain is the quarry which affords the material for *a priori* structures and dogmatic teaching of the *veritatis atomæ*, it is also the means, the medium through which we learn all we can know.

Unfortunately the senses are such masters, and rightly so, that they prejudice us overmuch in leading us to believe their data are comprehended in form and time, and contain no more, though there is a heaven over our heads as well as an earth under our feet.

Kant perceived that the forms of thought necessitated by our organisation, and which lead man to dogmatism as well as to the truth necessary for time, must themselves become objects of criticism if we would reach a comprehensive philosophy.

Pessimism and optimism are both extreme views of things.

The present conditions are obviously much more good than bad, but still far from what might be idealised as best. The strife and striving for good is largely weak. The good reached is not at high-standard level.

The remedy is in ourselves, though few know its use, or can use it. Are we what we see and feel? If we are, pessimism has a strong basis; but we are not, though convinced we are.

Truth is truth, says our good Professor. We may well ask, what is truth? A man may prove much that has no other truth but in him, and all be a turnip lantern leading to a precipice over the sea.

The idealistic views of the world, as Berkeley and Kant

and other thinking men have proved, are the true views of the world. Such is the last conclusion.

Is it not clear that philosophy may be ever changing its point of view, but that for us the proximate is the real?

Our striving must be against *negations*. These negations, however, differ from algebraic quantities, being + in proximate relations, — in the wider sense.

Can we separate object and subject? Myself is nothing but a part of my body, my body is nothing but a part of my food, my food is nothing but a part of the earth, the earth is nothing but a part of the solar system.

My body differs from my food in its living arrangements, which we call organisation. Through our organisation we get sense, emotions, perceptions, knowledge, and the world and God are revealed to us. (See Milton, Book V.)

In ourselves we rule or may rule = Will.

Will = choice. Choice varies with object or indifference.

This determined by many circumstances — health — intellect.

Therefore the operations of will are different and various, differing and varying with circumstances.

Knowledge = relation.

Explanation = classification.

The outward world a hieroglyph.

(SCHOPENHAUER, vol. i, p. 115.)

Purity = oneness. Water is pure when it is water only, and it is considered pure water if it contains atmospheric air + extra oxygen, provided it be wholesome to the blood; but should it contain deleterious air, though logically as pure as when it had atmospheric air only, it would be thought impure.

Purity is therefore used to signify absence of what is injurious, absence of everything hurtful.

Moral purity seems also to imply this.

The chemist uses it for oneness, for a thing which is itself and without admixture.

Practice first, philosophy after.

The forms of organic life are infinite. There is the

whole vegetable kingdom, so varied and extensive, that with our present knowledge it defies definition, much less an enumeration and classification of its members. If we took a unit of any one species of this kingdom, it would exhaust our powers to make plain the history of its life. Yet we know enough to enable us to see that in this kingdom the primary step of organisation was made.

Whether animal or vegetable first came is open to further question, but that the animal kingdom has been and is superimposed upon the vegetable is plain.

Now Pathology, like her elder sister Physiology, could occupy herself without stint on any part of this wide field of life, and we have to do so for the side-lights to get on our special subject.

The pathologist follows the steps of the physiologist, and often their work is but one.

If the self-will interest which man naturally has in his body, did not prevent as well as quicken the operations of his mind, we should much more clearly see that often what we call and think of as pathology was but physiology in another form. Decay and death are physiological—that is, natural and part of life; but we had rather not think so. We would rather that the course of nature was more in our own hands. We have indeed much power in directing and modifying the course of nature, but we mostly begin not only in the wrong way, but at the wrong end.

The education and correction of the psychic force is worthy of all attention. The so-called disintegration of moral nature, and its re-establishment by reciprocal control of the nerve-centres, is a proper work of science. But here we reach a region in which our anatomical conceptions are sure to be at fault, since they reach but to form and not to composition.

The solution of the mystery seems so near, and yet is so far off. We have evidence from the history of the earth that incalculable time and incalculable circumstances have been in the problem. All the forces of our planet are in the problem. And not only the forces of the earth in matter and gravitation, but also the celestial forces of light and

heat, both primal and present. And further, the eocene germ forces their constant operation and augmental through all time; and further, our need of education into the study of nature, and the works and workings for a successful inquiry, are all considerations which show how far off we are from knowing what we are, and how we came to be.

Doubtless for the ends of practice we have knowledge enough at least for our moral guidance, and science continually though gradually adds to our consciousness of life; but for full knowledge we are 'infants in the dark.'

If we could see the working of the world's forces without projecting *ourselves* into them, how educational an effect on us it would have!

Instead of this we project ourselves into them, combining and distorting them, and seeing only ourselves in them, and that only partially and falsely.

Das Ding an sich does not exist.

This is a human idea only. Everything is *das Ding an sich*, or belongs to it. If it did exist we could not know it. It is therefore inane to discuss what we cannot know or conceive.

"In the beginning." In the beginning of organic things Light was the factor; but whence light in the *ratio rerum*? The advance in our knowledge has shown that light is but related to the other forces. Though all the effects of sunlight have not been produced by electric light, the steps made that way encourage the hope that such results will be obtained. Yet so wonderful is it even to those (and even more to those) who are familiar with the fact, that light which by our structure we feel as a sensation, and light to which we owe our life, should by common sense be identified by us, though under forms entirely different.

"Hail, heavenly light!" says Milton. This apostrophe is of wider bearing than it is likely the poet thought. Light is the primordium of organic things. Light is the master sensation in us. The light sense, in all its details of transparent, refractive, sensitive, motor, and central condition, presents us with the culmination of organic facts.

Organic structure, the result of solar light, brings on a new world. The dark world is mechanical. The world, including light, is more than mechanical.

We, as living things, know this. We have sensations of novel kinds, conscious likes and dislikes, impulses of different orders, or more properly called *appetites*.

The mind must be either one with nature or outside of it.

All evidence and expression show it to be one with nature. If it be so, so-called material must be more powerful and wonderful than we generally believe. There must be not only the three dimensions of space, but that which has no dimension.

The analysis of nature has not advanced far enough to admit of a theory of it.

The whole field of sensation, of thought, and of moral and intellectual relations, has to be brought under scientific research before any general statement can be made.

One thing would seem probable, namely, that mathematical dimension is not the whole measure of nature; that, in fact, the three dimensions do not measure the material—at least in all cases.

Moreover we have no complete knowledge of compound atoms.

It has been said that the combined intelligence of many men is higher than that of any one in the combination.

It may in some such sense be true that compounds may possess properties intellectually higher than the components.

One's whole life might exhaust itself in studying the form and nature of a leaf, and yet leave in it an undiscovered world. If this be so of any simpler object in nature, how much more of an organised body such as man's!

When we remember with what punctiliousness the students and defenders of religious dogmas insist upon a point, a letter, or a word, we students of nature should take a lesson to our good, and to our study's advancement; for here no

point is accidental or equivocal, none without eternal authority. So much cannot nearly be said of studies which begin and end in our own ideas.

Do not explain Nature, but by patient attention to the facts let her explain herself.

There are no generalities existent in nature, but only particulars. The questions for science are always what is the special fact, and next, what follows this.

Generalities are human formulas to help our weakness of thought, or often idleness of thought, or rather want of thought.

If the human mind is to grow, and if its scope of knowledge is to increase, it must be by the study of things in their widest relations. The old idea that the earth is the centre of the universe and man the centre of the earth is largely exploded; and all the questions "why" have been dissipated in the explosion, whilst science is patiently and humbly occupied with "how" and "what next."

The work of medical students is to inquire into the "how" and the "what next," and not into the "why."

A study of nature shows that there is continuity throughout.

"Reason has short wings in comparison with nature's."
(DANTE, 'Paradiso.')

The greatest advance that can be made in practical Science is to a full and intimate recognition of our ignorance.

We may not satisfy ourselves with logical and *a priori* conclusions demonstrative to our reason, whether in things Natural or Spiritual. In both we have to learn the relations of each. Learn by observation, study, and experience. We know that bread nourishes by eating it, not from the chemist's analysis.

Science and common sense differ as cultivated fruits differ from wild fruits.

Science sows its seeds of inquiry, and gathers the fruit. Common sense picks the fruit, such as it, is by the wayside. Common sense has no fields or orchards of knowledge.

The organisation which exhibits itself in living things is a great second page of nature. The human mind can conceive of organisation without life. Organisation does not seem to produce life, but it expresses it, and produces it in a new and higher order. A watch or any other piece of machinery may represent organisation, but not living organisation.

There is no psychology but on an organic basis ; living organisms present, and some are the alone basis of mental facts.

Our senses and our sensations give us knowledge. May we not infer that they are essentially related to the things they inform us of ?

Spinoza says the mind is known only through the body. In other words, the body reveals the mind.

The germ of life is independent of the conditions which evolve it.

Darwin deals with evolution, not with origin.

Spencer tries origin, but altogether fails.

Health.—This is a subject which appeals to all. What is it ? It is maintenance of the body in strength for our use, so that we may think and do without knowing that we have a body. A healthy man lives and acts, wakes and sleeps, without being troubled about his body. The machine—for machine it is—works quietly day and night without troubling its possessor. It has its own rules and laws, which in health it quietly keeps. When hungry it asks for food, and when satisfied would, if the master would let it alone, leave off eating. But master and doctor and friends and ignorance and prejudice are almost always offering the living machine advice, and making it go wrong by excess or some fanciful thing or other. The various parts of this

living machine have emotions of their own which guide it, though we are unconscious of what they are. The heart beats, the breathing proceeds, the food is digested, and the other different works are performed quietly and regularly, and more regularly if the master does not interfere.

It is often and often the master's interference directly or by way of some suggestion, which disturbs this daily performance which we call health, and which is indeed health.

The master has his work to do, and if he does that work well and truly, and leaves his servants to carry on the work of the house, good order will mostly be kept.

There are no byways to health of mind or health of body. The straight road is narrow.

The law of health is the law of life. This is not a truism, but a law.

No man must be considered to have been well until he was, as it is commonly expressed, "taken ill." And no one can be pronounced healthy until after examination post mortem.

Drugs given in *disease* are, not unfrequently, for the most part hurtful, perhaps universally so. The object of medical treatment is to maintain the life processes.

I do not say that no drugs are useful; but there is not enough discrimination in their use.

There are many good general practitioners, there is only one good universal practitioner—"a warm bed."

The one fatal blunder of the profession is the belief that we can treat, with advantage to the patient, the acute maladies, and that we ought and have power to treat the tissue changes, though all admit we are ignorant of the nature and living course of the changes.

When one undertakes to show the way, he should know something of the path.

In therapeutics this has often not been so, but the most confident have generally been the most ignorant and dangerous guides. Nor is this criticism confined to unlearned men so called, but honoured and acknowledged authorities have often been proved by the course of time to be as dangerous as the more ignorant and unlettered. What shall we do? Rest and be still. The workman that made the machine can repair it, all hindrances being removed. Study the hindrances, acquaint yourself with the causes which have led up to the disease. Don't guess at them, but know them through and through if you can; and if you do not know them, know that you do not, and still inquire. "Cannot" is a word for the idle, the indifferent, the self-satisfied, but it is not admissible in science. "I do not know" is manly if it does not stop there, but to say "I cannot" is a judgment both entirely illogical, and in itself bad as favouring rest in ignorance.

The study of Medicine is an object lesson; the object, man's body in health and disease. Man's body as a separate thing will be best understood by comparing it with the bodies of animals. This should be a wide and careful study.

Knowledge of phenomena, sense, knowledge of forces, interpretations, formulations of forces when known so far as to be subject to formulation, tend to forecast and use. The current is running on in a given line; this we hinder or divert by other forces, kindred or added. Such is Medicine and Surgery.

What we call health, which looks so fixed and stable, is more changeable than the stability of the rainbow. Its maintenance depends upon the moving equilibrium of more forces than the mind of man can realise.

We still have doctors who believe in themselves.

Give your intellect without stint to your profession, not your heart.

That which is healthy works upon its objects, that which is diseased works upon itself.

"Things are not what they seem."

The reality and the truth are not to be settled off-hand by our untutored conceptions.

Brain and mind are still mysteries to our ignorance, and yet we express our opinions about them. I wrote to —— :

"I don't know what brain is, I don't know what sleep is, but I know that a well-nourished brain sleeps."

As we may have double vision, so we may have double consciousness, explained, as it would seem, by our two cerebral hemispheres.

In cases which I have observed, the two states have not, however, been equal. Thus a patient will say when questioned, "I am quite well, but a gentleman in the house was very ill last night," the condition being one of memory rather than of consciousness.

The conditions of delirium give but doubtful evidence for or against the oneness of the ego.

So far as investigation has gone, we seem to see that the oneness is a resultant or the expression of a complex unity.

The central fact of our existence we cannot reach by anatomy or physiology. These sciences deal only with time, space, and relation.

Here lies the arena of practice wherein we may strenuously and hopefully toil and strive, admitting the essences upon which they repose, and declining to discuss or deal with what we have no faculties for knowing as science, but only as a sure ground of belief.

Hydrophobia.—Of all the strange excursions which the intellect has taken in search of truth, none is more strange and curious than that of M. Pasteur for the discovery of a remedy against the bite of a mad dog.

M. Pasteur had not been a student of hydrophobia, nor was he acquainted with the facts of this or any other disease in animals, men, or dogs, so that he started on this inquiry without knowing the character of the country he had to travel through. It is necessary to premise this, or the course he took would seem but little calculated to lead him to any useful result. He knew, as all have known, that the bite of a mad dog produces its results not by fright of the person bitten, but by the poison on the tooth.

He probably reasoned, as many a one has reasoned, on the similarity of the bite of the mad dog and the wound of the poison fang of the rattlesnake. And no doubt he noticed the difference in time which the two poisons take to produce fatal results, that at once in a few seconds the poison of the rattlesnake begins to produce its dreadful effects, and kills within as many minutes as it takes days or weeks or, strange to say, even years, for the tooth of the mad dog or wolf, however venomous, to produce hydrophobia. Whether he thought of this or not, no one can say. One thing is certain, for he has told us, that it was the vaccine point which is used in vaccination which impressed him as most analogous to the dog's tooth and the poison conveyed to that of vaccine.

It is right to state that only a want of knowledge of the circumstances, natural to one who had no acquaintance with the facts could have favoured this analogy, since, so far as the known facts go, the vaccine poison and the mad dog poison have nothing in common. It may turn out to have been a happy ignorance, which made the way plain to what follows, which enabled the scientific fancy to leap over much which would have arrested the pathologist on the same march. However that may have been, so it was. The vaccine poison works out its results in a very definite and traceable way, both in time and place.

What is education? Teaching a man what his powers and relations are, and how he can best extend, strengthen, and employ them.

Education is not learning, but the training of the mind that it may learn.

What our education most needs is enlargement as to the intellectual and moral nature, as a scientific enquiry.

What can advance man? A careful government of his body in respect of its appetites and exercises. A pains-taking education of his mind and moral nature. The source of this advance lies in the man, lies there often hidden and stagnant. Selfish, narrow aims and purposes afford no stimulus. Ignorance and indifference have no quickening forces, or suffocate them.

The power of forming ideals is peculiar to humanity ; and the higher the ideals, the higher the humanity. Lower animals have no ideals.

Man works by ideals, the fictions of his intellectual and moral nature built up from experience and transcending it.

Man cannot perfect his mechanical works without an ideal standard, such as pure mathematics ; so neither can he perfect his moral and intellectual works without the idea and conception of God.

A man's life is not what he reads or what he thinks, but what his inclinations and aspirations are ; in fine, what his inner life is.

As there is a moral law in man and an intellectual law, the world must substantially be moral and intellectual.

Why this is not so evident is from the predominance of the lower animal laws ;—and hence our not reaching to the higher organic stage—the manhood as contrasted with the bestiality.

Then what is our hope ?

Our hope is even in Thee (Eternal).

The moral man is higher than the intellectual. That

reaches to the centre, this to the conditions ; that to what is, this only to the conditions of what is.

The moral law and the physiological law are one. The physiological law is the *law of life*. Life in its entirety includes all.

It is not the aphorisms of morality which transform a man, but the width and depth of his view of the conditions of existence and life.

Life is a heavenly problem, to be worked out in earthly materials.

I could often wish there was more *faith* in *physiological* laws.

The nearer I approach to the end of life the more I am impressed with the spiritual nature of things. It is the sensuality (not sense, but sensuality) of our nature which restricts and hinders our clearer view.

The sense of personality in man is the source of his errors intellectual and moral.

Even the most material work should have the spiritual element in it ; intellect and duty.

If the fear of the Lord is the beginning of wisdom, the love of Him is its fulfilment.

This includes and excludes much. Includes pursuit of all truth, and excludes self-love.

Man is an agent in world development.

It is obvious that the economic progress of the world is built up on self-help and mutual help, under the rule of necessity.

In living things there is everywhere relation, adaptation, dependence and interdependence.

The intellect of man, in operation, is the providence of God.

In life there are some few precious moments of repose, and blessed peace ; . . . but most of life is a striving with a sense of failure against forces too strong for us,—“rowing,” indeed, “hard against the stream.” But we must not forget that the mental and moral striving is God’s power in us, as is the sunshine His power about us.

Time does not make us stronger, but it may make us better in many ways.

To do anything well favours strength, because it leads to perfection.

Do not let the injustice of man lead to “retaliation.”
Do not do evil because you have suffered evil.

Time brings all good things, even when it brings death.

V. CONCLUSION.

THE facts which have been given in the previous chapters of this brief description or survey of one of the remarkable men of his Profession in this century are of greater value than any comment that can be made upon them or him.

It is obvious that Sir William's early education rested mainly on his mother's wisdom and love, and on his own innate force. His manly English father, and his mother, trained in the faith of that branch of the Church of Christ which made Wilson, George Herbert, and Ken, laid the foundation, and fixed the bent of the boy's character. Contact with Nature, on land and on water ; watching the fishers at their labour, marvelling at the growth of the plant, and the ways of the birds as they asserted their rights on the tree tops, filled him with a yearning never suppressed to unravel the hidden mystery of all that live or have lived on earth, and the relation of each to man.

This education, adequate for a capable child gifted by nature with the power of observation, and with a thirst for knowledge of all things seen or unseen, prepared him for the complex studies of his after life—whether in botany, or comparative anatomy ; of man in health, and in disease ; living in virtue, or in vice, in wisdom, or in foolishness ; and developed in him those qualities which make a great physician.

It would be unjust to pass unnoticed both the wisdom and kindness of his various teachers, who each sought to give opportunity to the latent powers they felt to be in their keeping, culminating in the care of a country rector, Mr. Harrison, and the consequent opportunity for full development of power, placed at his disposal by the Treasurer of Guy's Hospital. It should be said that such perception and such goodness are indigenous among us everywhere

and at every time, through the freedom of the English people when left to their voluntary efforts for good.

It would not be well here to discuss the precise turn which Gull's mind took when his professional tutelage was completed, nor of the discussion to which his curt statements on Water—and Mint Water; and Wait—Watch—gave rise at a time when polypharmacy was not extinct, and when hundreds of good medical practitioners were only paid for their services and their knowledge by the cost of the medicines which the sufferers consumed or received. It was a period of transition, now thoroughly understood and happily well-nigh closed. In public Gull rarely spoke of these things, save in his hospital, to his students.

It is without question that Frederick Denison Maurice was to Gull from the first, at once attraction and light. For at that time—1840—before the bitter controversies on theological questions were at their height, Maurice gave to the best youth with whom he associated, an idea of spirituality with power which they never lost.

The inner depth of his nature was never more touchingly revealed than shortly before the end came. Sir Henry Acland writes: "I was sitting alone by his side, and, as was his wont, no continuous conversation passed between us. Suddenly, in his deepest and most earnest tone, he slowly said, 'Acland, do you know what I am?' Not divining what might be his meaning, I replied, 'Not at all.' 'I am a Christian Agnostic.' A better account of my dear friend could not be given. Would there were more like him!

"It summed up, it seems to me, the whole of his deepest convictions. 'Not by science—not by knowledge alone—do I live and die. I live by Faith—in Faith I die.'

"Probably Sir William's deep interest in spiritual questions during half a century, together with the originality and depth of Maurice's religious thought had, unconsciously to himself, framed his concentrated creed—CHRISTIAN AGNOSTIC. It calls to mind the 'Student's Prayer' which Francis Bacon left to all generations. This prayer is as follows:

"'To God the Father, God the Word, God the Spirit, we pour forth most humble and hearty supplications; that He,

remembering the calamities of mankind, and the pilgrimage of this our life, in which we wear out days few and evil, would please to open to us new refreshments out of the fountains of His goodness, for the alleviating of our miseries. This also we humbly and earnestly beg, *that human things may not prejudice such as are divine*, neither that from the unlocking of the gates of sense, and the kindling of a greater natural light, anything of incredulity or intellectual night may arise in our minds towards divine mysteries. But rather that by our mind thoroughly cleansed and purged from fancy and vanities, and yet subject and perfectly given up to the divine oracles, there may be given unto faith the things that are faith's.—Amen.'

"It may help some to know what were the convictions of this robust and independent thinker—who through a long life had observed man from birth to death in every condition, of every kind—when in full possession of his reflective faculties, and in full consciousness that his death would probably be sudden. He so summed up the mysterious ways to knowledge that have in the evolution of our little world become open to man."

This memoir cannot be more fitly closed than by a quotation from a poem written by one of Sir William's old pupils at Guy's—Frank Smith, entitled "The Worker." The passage, marked many years before, was read by him one Sunday shortly before his death, with evident emotion. It refers to the death of a man of science, whose life had been spent in seeking the 'Elixir,'—"the great life giving secret" that should give to men health, strength, and length of days. To those amongst whom he had lived it seemed as though death had but ended a life of visionary hopes and aimless toil:

"Even such the life, even so the end, a search,
A life-long weary search, for what? for nought

. and this was all.

"*This was not all*, for God on high Who wrought
Himself six days to form the mighty world,
His eyes beheld the long and patient toil
. The pure and high design.

He hath received him and

 . . . hath given charge to such
 As are the mightiest around His throne
That he should learn the springs of law and fate,
 The secrets and the mysteries whereof
The bounds are space, the time eternity."

Those who heard him read these lines could not doubt that the words expressed his own conviction that death was not the end—that after death would come new light—and that the life-long yearning for fuller knowledge would at last be satisfied.

In accordance with his own expressed wish Sir William was laid to rest near his father and mother in the churchyard of his childhood's home. On his grave is his favourite text,

"What doth the Lord require of thee,
 But to do justly, and to love mercy
 And to walk humbly with thy God?"

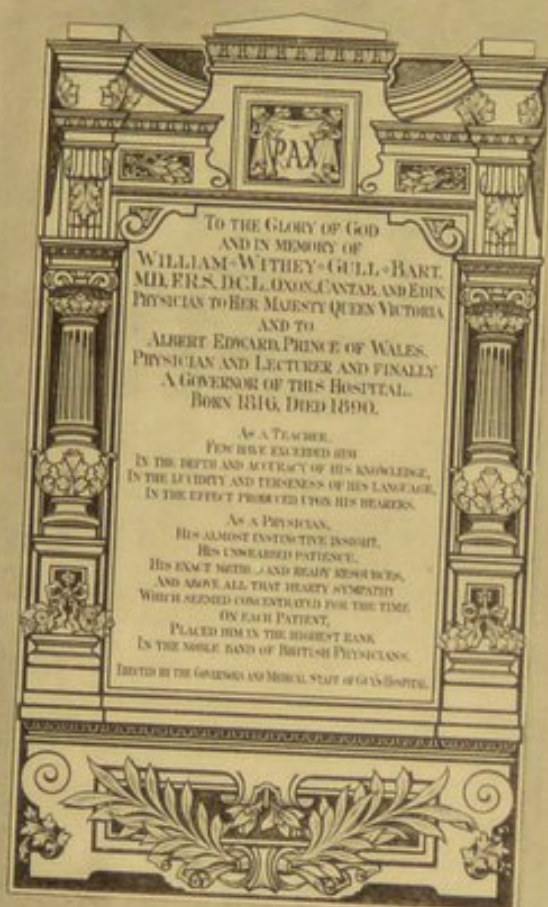


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SECTION VIII.

ADDRESSES.

SECTION VII.

ADDRESSES.

SOME GUIDING THOUGHTS
TO THE
STUDY OF MEDICINE.¹

Γνώμης δὲ δύο εἰσὶν ἰδέαι· ἡ μὲν γνησίη· ἡ δὲ σκοτίη· καὶ σκοτίης μὲν τὰδε
σύμπαντα, ὄψις, ἀκοή, ὁδμή, γένσεις, ψᾶνσις· ἡ δὲ γνησίη ἀποκεκρυμμένη δὲ
ταύτης.

Canons of DEMOCRITUS.

GENTLEMEN,—Our intellectual, like our bodily vision, requires us sometimes to place ourselves at a distance from the objects which engage our attention, that we may obtain more correct ideas of them as a whole, and of the relations they bear to collateral subjects.

The present is an occasion for such a survey, as being especially necessary to those amongst us who to-day begin a new career, and now fairly launch upon the ocean of life; for how important is it that they should, in nautical phrase, “take a right departure,” richly freighted as they are, and with bright hopes and anticipations of a prosperous voyage!

The study of Medicine conjoins some of the strongest and highest motives to its earnest cultivation;—its objects are of universal interest to mankind, and appeal to the common principles of our nature, so that we may affirm with the proverb, “*primus homo primus fuerat medicus* ;”—it is so

¹ A Lecture delivered at Guy's Hospital at the opening of the Session 1855-56.

generally esteemed as to obtain respect from the most barbarous ;—its scope is so wide as to give exercise to all the faculties of the mind, and it borrows from the stores of almost every form of human knowledge ;—it is an epitome of science ;—its operations are so benevolent, that our Divine Master himself assumed its offices as a type of his spiritual ministrations ;—it has in it the very quality of mercy, and

“—— is twice bless'd,
It blesses him that gives, and him that takes.”

Medicine holds a foremost rank amongst the natural sciences, and can only reach its full development as they advance to perfection. It is the centre to which some of their brightest rays converge, for where beside can we look for such illustrations of the highest expression of natural laws as are found in the structure of the living body. It has been well said,

“—— Man is one world, and hath
Another to attend him.”

The first principle for the student to recognise, and one to which in after life he will often have to recur, is that his work lies not in the fluctuating balance of men's opinion, but with the unchangeable facts of nature.

The rapid rise and spread of fanciful speculations, the success of theories and confident dogmas, obscuring for a time the more sober realities of experience, may make him doubt if his path lie on so firm a ground, and perhaps tempt him to try others less arduous and more hopeful ; but he must disarm these suggestions with the confident assurance that his object is not *opinion*, but *truth*.

The foundation of the study of Medicine, as of all scientific inquiry, lies in the belief that every natural phenomenon, trifling as it may seem, has a fixed and invariable meaning ;—a flitting pain, or any other scarcely noticeable inconvenience, being like the form of a summer cloud or the inconstant currents of the air, the result of laws as durable as those which sustain the more solid and immovable structures of the world. The problem of their solution may be infinitely

complicated, and often beyond the reach of our present means of knowledge; but we may surely conclude from analogy, that even in the *fluctuating* and apparently *accidental* there is the same constancy of action as in that which bears upon it the more obvious stamp of fixity and durability. Unstable as are many of the phenomena we have to inquire into, presenting themselves to us at the bedside in an almost unending variety, like the combinations of a kaleidoscope, we can successfully grapple with them only when we are impressed with the certainty that they result from *some simple and unchangeable laws*. This conviction supplies a constant stimulus to the mind, quickens its energies, and excites its curiosity with the feeling that there is an attainable object, and that truth will reward the toil.

Scepticism in science is as baneful as in matters of testimony and revelation; it is a dead hinderance to all progress, a *upas* in the mind. The motto in the pursuit of knowledge, of whatever kind, has always been, "*Hope all things;—Prove all things.*" *Nature is inexhaustible*. As yet she has but yielded us a few instalments for our labour; let us not believe she has no more precious rewards to give. Although it has taken centuries, and the labour of some of the greatest intellects, to build up the science of medicine, as we now have it, and it may be called a "goodly heritage" of knowledge, yet let us not be content with the mere acquirement of it, but rather cultivate in our minds the feeling of Newton, when he had perfected an eternal structure with his own hands; "I know not," said he, "how I may seem to others, but to myself I seem but as one who has gathered a few pebbles on the illimitable ocean of truth." There are no bounds to nature's wealth, and in her yet hidden stores are doubtless rewards for industry as full of blessings to mankind as any she has already conferred.

Bewildered and disheartened with the difficulties of our task, we are sometimes ready to accuse nature of obscurity and uncertainty, and, in the childishness of our intellects, attempt to govern when we are too ignorant to obey. The source of those false systems which have disgraced our profession have had their origin in this kind of vanity, turning men from the patient ways of true investigation into the

bye-paths of ignorance and superstition. In spite, however, of fashions of opinion, or those false systems of medicine, we return to the truth, that our studies require of us a close acquaintance with nature, where, as Hippocrates himself taught, "Each thing, both in small and in great, fulfilleth the task which destiny hath set down."

The clear perception of this truth conferred upon his labours the immortality they enjoy, and supplies us with the highest argument for precision in our observations, for if such material atom courses with undeviating exactness through the mystical cycle of our organisation, it must need all our vigilance and care to track its intricate paths.

Plato's inscription over the gate of the gardens of Academus—

"Οὐδὲὶς ἀγεομέτρητος εἰσίτω"—

would be equally appropriate over the portals of Medicine. The study of organisation constitutes a divine *mathema*, a discipline wherein our mental faculties may find their highest exercise; and though the student of Medicine may be ignorant of the details of mathematical science, and unable, from the mere want of instruction, to pursue to their elaborated issues the relations of number and space, yet its spirit must be in him;—the same certainty of truth, though its kind be different;—the same cautious investigation, though the paths vary;—the same perseverance in pursuit, though the difficulties be as great, and the way be often impenetrably obscure.

The student of Medicine can no more hope to advance in the mastery of his subject with a loose and careless mind than the student of mathematics. If the laws of abstract truth require such rigid precision from those who study them, we cannot believe the laws of nature require less. On the contrary, they would seem to require more; for the facts are obscure; the means of inquiry imperfect; and in every exercise of the mind peculiar facilities to err. The truths of mathematics are, moreover, essentially accordant to the mind, whilst those of nature are often contrary to all anticipation. Can it require a higher intellectual capacity, or greater powers of concentration, to demonstrate the

properties of a circle, than to explain the organisation of the body, or rightly to estimate, at the bedside, the relative importance, in a series of obscure symptoms? The kinds of mental exercise may be different in these *mathemata*, but in both there is range for the highest faculty of thought. The modern introduction of chemistry, botany, and physiology into the older universities is a public testimony to the truth of the principles I am desirous to maintain, and a further motive for the daily culture and discipline of our minds in the same pursuits.

The student of Medicine has, however, a twofold inducement to approach his subject in the truest spirit. He has not only to discipline his mind and fit it for the acquisition of knowledge, but to *furnish it for practice*; his object is both *education* and *acquirement*; mental training and practical knowledge. If he make mere acquisition his only object, he commits an error apt to defeat the very purpose of his industry. He comes here for medical education, which includes the *learning how to learn*, that when he leaves this hospital he may be able successfully to gather experience for himself, which is the *true end of education* where *knowledge is essentially progressive*.

Plunged, as a student is at the beginning of his studies, into a vortex of many subjects, *all is chaos*;—he begins chemistry before he knows the ordinary laws of physics; the anatomy of the most elaborate piece of organisation, before he has looked at the more simple; the study of human physiology, before his mind has contemplated the less complex functions of a plant. To tell him, therefore, that he must begin with method, seems like mocking him with an *ignis fatuus*. It is, however, the only way of escape from the confusion, and begins by the exercise of patient attention. The greatest intellects without it are weak. Newton himself, the prince of men, of whom it stands written, "*genus humanum ingenio superavit*," said, "I keep a subject constantly before me, and *wait* until the first dawnings open little by little into a full light."

Method is an orderly and progressive activity of the mind, leading us to view a subject in every light;—to exhaust it, as it were, by observation;—to track its relations;

until at length, having gone through it and about it, the mind rises above it, and contemplates it as an element of truth ; a fixed point for the investigation of other truths, until, by gradual addition, the form of science rises in the mind.

Method is to the intellectual faculty what light is to the eye ; without it we labour to no end, like toiling through a thicket without path or object. As the ancient fire-worshippers continually served their altars of flame, so must we ever refresh the lamp of method, and strive to diffuse its brightness over the mind. To use the words of Bacon, "in this we should imitate the divine foresight and order, for God, on the first day, created only light, and assigned a whole day to that work, without creating any material substance thereon."

If method be our light and our path, the senses are our pioneers. In Medicine, they are the indispensable servants to truth, though we are often too sluggish and careless to employ them aright, and apt to prefer the suggestions of imagination to the more sober evidence they alone can supply. The errors from mere want of observation are so common, and yet often so easily avoided, as to make one sometimes feel that it requires but a right use of the senses to master the difficulties of our profession.

We have no longer gravely to discuss whether there be advantages or not in the use of the eye and the ear, as some seem to have doubted who have questioned the value of the aids to these senses in the study of disease. He must have taken a wrong path who asks "Is the microscope of use? Is the stethoscope of use?" On the contrary, instead of voluntarily submitting to the dulness of the senses we have, we are almost tempted at times to wish for more means of direct insight into the things before us. But perhaps some will say, many have practised their profession successfully, unaided by the implements of modern science. Without discussing the merits of such an assertion, we may answer that some blind persons have been expert enough to tell colours by the touch, and others less favoured, who have made considerable advances in knowledge ; yet there are few who would prefer such limited acuteness to

the glimmering of light, however feeble. A lifetime of practice may do much to compensate for the want of more ready and accurate means of knowledge as by mere touch we may become acquainted with most material forms ; yet no one would reject the service of the eye which reveals them in a moment.

The cultivation of the senses is no unimportant part of the student's task. To him we may say, "apply your senses continually to the work before you." There will hereafter be many hindrances to the free use of these means of knowledge, when he will be most anxious to avail himself of them, and when he may be obliged to act upon the experience he has now an opportunity of acquiring.

But the senses alone cannot inform us of the truths of nature, they must be reached by thought and reflection, without which it is mere groping in the dark. Other animals have senses often more acute than man's, but no intellectual insight into the things they see. No application of sense, aided by the best means that art can devise, can by itself bring us to the objects of our search ; the data that so flow in, require the ever active mind to give them their true place and meaning. Yet I would repeat, there are few things more important to be urged upon a student, than the constant application of his senses to the objects of his pursuit, for the reading of books is so easy, and by them knowledge seems to come as it were by inspiration, and we float so pleasantly along on these paper wings, that the harder toil of observing for ourselves is apt to become distasteful.

Books are but secondary aids to knowledge. They can be read to advantage only after observation, or as helps to it ; to trust to them alone, is to spoil the faculty of observation, for we do a violence to our intellectual nature, when we take that on faith which should be admitted only on demonstration. Knowledge so acquired, however full, and round, and beautiful it may seem, is but as the child's bubble, and will collapse on the least contact with the realities of practice.

All physical knowledge, to be durable and useful, must be built upon the evidence of the senses. In this Hospital,

every care has therefore been taken to lay plainly before the student the phenomena he has to study ; and in its wards, through which pass a ceaseless stream of human maladies of every form, he may acquaint himself with the science and practice of his profession.

It is by observation we begin, and by it we perfect our knowledge. In its exercise we must pass, as it has been said, from the forge of Vulcan to the temple of Minerva ;—from the employment of the sense,—to the operations of the mind, if we would penetrate the hidden meaning of things ;—if we would *interpret* nature rather than content ourselves with looking ignorantly upon the surface of her hieroglyphical pages,—for this is not education. A man is not educated in a foreign language, who, when a book is presented to him written in it, can only tell the number and names of the letters. He must be able to combine them into words and sentences, and to look through them into the author's meaning, before he has any pretensions to that kind of learning ; and so it is with the student of Nature's book. Phenomena are the letters, and their combinations the words, of that page which we have to study ; and careful must we be to punctuate and accentuate them aright.

But if facts be nature's words, our words should be true signs of nature's facts. A word rightly imposed is a landmark indicating so much recovered from the region of ignorance ; a step in progress. It recalls the nature of the subject, and becomes a symbol of all our knowledge upon it, a genuine and current coin in the intercourse of mind with mind.

But in our profession there are words, *like quicksands*, changeable in their meaning, and full of danger. Complicated actions, often but little understood, are expressed in a word, and such words, surrounded by the tinsel of speculation, receive an idol-worship, and, perhaps, victims at their shrines. But notwithstanding this, there is a divinity in words. What are the details of a case, and its history, if we have not the power of completing the equation, by adding the suitable word to express the essential condition of the whole ? The *name* at once lights up that which was before obscure ; at once reveals the meaning of the facts, and concentrates the experience of the past with the knowledge of the present, and

throws a kind of prophetic ray upon the course and order of the future.

A student may often, with recreation and profit, scrutinise the grounds of scientific language. Much is often said, on occasions like the present, of the advantages of a knowledge of languages ; of the position it gives in society and of the honour it reflects on the profession. This you will all admit, for the members of our profession cannot be deficient in those parts of learning, which distinguish the well educated in general, without yielding the position they are entitled to enjoy. But medicine is essentially a learned profession. Its literature is ancient, and connects it with the most learned periods of antiquity ; and its terminology continues to be Greek or Latin. You cannot name a part of the body, and scarcely a disease, without the use of a classical term. Every structure bears upon it the impress of learning, and is a silent appeal to the student to cultivate an acquaintance with the sources from which the nomenclature of his profession is derived.

But to return ; our object in the study of Medicine is to know the human body, and those external agents which surround and affect it, either as necessities to its health or as sources of disease. All our knowledge must centre here. However wide our inquiries, they must find their home here or be altogether useless.

Medicine requires not only the intellectual cultivation of a science, but the patience and practical skill of an art. At the bedside we must be animated by the feeling of faithful artisans, of men whose object and duty is practical work ; for when the art of Medicine is needed by the suffering and the dying it is no question of mere theoretical knowledge and extraneous acquirement. But skill in the commonest art is not to be attained without much practice, far less in the complicated and difficult art of healing, where every case presents some peculiarities. To practise it successfully, we must have made our home at the bedside, and, if I may say so, have lived with disease, observing it in all its forms and changes. The opportunity of doing so can be obtained only in a large hospital like this. Chemistry, botany, and physiology may be pursued in the study or the

lecture-room, but the practice of our profession only at the bedside. There alone can we acquaint ourselves with the features of disease, the symptoms it exhibits, and the remedies which relieve it. If a student is to become a practical and expert workman in his profession, it can only be by a large expenditure of time at the bedside ;—there he must get the facility for practical investigation ;—there he must sit with the objects before him, and note and methodise the facts which lay the foundations of experience.

But man individually is but a unit in a large account,—a living atom in the great body of human social life, and so to study him is a subject demanding some of our thought and work. By looking at large numbers, facts before unnoticeable become proportionably magnified. Causes affecting health and shortening life may be inappreciable in the individual, but sufficiently obvious when their effect is multiplied a thousand-fold. If the conditions of society render us liable to many diseases, they in return enable us to establish the general laws of life and health, a knowledge of which soon becomes a distributive blessing. The cure of individual diseases, whilst we leave open the dark fountains from which they spring, is to labour like Sisyphus, and have our work continually returning upon our hands. And, again, there are diseases over which, directly, we have little or no control, as if Providence had set them as signs to direct us to wider fields of inquiry and exertion. Even partial success is often denied, lest we should rest satisfied with it, and forget *the truer and better means* of prevention. Therefore, although at the bedside, man, with all the peculiarities which distinguish him as an individual,—his parentage, his birth, his age, his habits, his previous diseases, and his actual condition,—is our daily and more especial work. Yet man, in his social relations, claims some of our attention, since it is only by the collective labours of the profession that the principles of Hygiene can be finally established.

Gentlemen, amongst all the varied occupations which the necessities of life entail, it is a matter of no trifling congratulation to have one that ennobles and expands our nature, and bends our faculties to the common good. Constituted as man is, it is certainly no slight advantage to

be the members of a profession in which the commonest duties require the highest principles, and are a constant exercise in the pursuit of truth. All true science has an upward tendency. As terrestrial influences point the needle to that

“ ——— stedfast starre
That was in Ocean waves, yet never wet ;”

so the mind, unfettered by prejudice and unswayed by passion, should, under the right influence of mere natural science, turn to *that Centre* which it recognises as the source of all its knowledge. Even heathen antiquity affords us such examples; and gross as was its mythology, it yet embodied thoughts struggling to light and purity. What else were its divinities of the several kingdoms of nature but so many plain acknowledgments of the presence of a divine power in universal operation. Why was it feigned that Minerva sprung from the head of Jove, but to indicate the source of heavenly wisdom? Why was Vulcan, the god of Physical Science, but a lame divinity, if not to teach that such knowledge by itself is defective and lame,—and why is it said that his principal works were a collar and a sceptre, but to illustrate how natural science may become to us, according as we use it, either an *enslaving* or an *ennobling* power.

It is an unfounded assertion that the study of Medicine necessarily stints the mind, limits it to second causes, and hinders it from reaching to higher realities than those of sense. “There is,” truly says Hooker, “no kind of knowledge whereby any part of truth is perceived but we justly account it precious—yea, that principal truth, in comparison whereof all other knowledge is vile, may receive from it some kind of light;—to detract, therefore, from the (true use and) dignity thereof, were to injure even God himself, who, being that light which none can approach unto, hath sent out these lights whereof we are capable, even as so many sparkles resembling the bright fountain from which they rise.”

There is not a step in the path of our studies but is strewn with such sparkles of the divine *wisdom, power, and goodness*. The truly philosophic eye has always seen them and rejoiced

in their light. The lessons they teach are no mere hypothesis or fanciful speculation, but a direct induction from the facts themselves. Of the structure and relations of the parts of our bodies, we may assert that they show no traces of a law of necessity, but many of the highest wisdom and choice—"multa sane sapientissimi consilii nulla necessitatis vestigia,"—evidences of design which, opening out into wider and wider fields of beauty as the intellect of man explores them, are an unimpeachable proof of Divine Wisdom.

As to Infinite Power;—if we stand in wonder before the truths astronomy reveals, and contemplate its mighty orbs balanced in space, and gathering from the scene fresh thoughts of God's power and presence, exclaim with the poet,

"An undevout astronomer is mad,"

can we overlook the infinity of power in another direction, and refuse to turn our eye inward upon the atoms of the living structures? They are balanced with a finer adjustment than instruments can measure, they move through their intricate courses with scarce a shadow of irregularity, now entering in to play their part, or now dismissed to be succeeded in their turn by others with such observance of law and order, that we are insensible of the change. If astronomy shows us power infinitely *great*, anatomy and physiology show us power infinitely *delicate*. There is an infinity in the division of force as there is an infinity in its multiplication.

As to Goodness;—all is framed for healthful exercise and pleasure. "There is no nerve," significantly says Paley, "whose proper function is pain;" and on pain itself what a volume could be written to show the benevolent design which renders us the occasional subjects of it. Every part of our structure is replete with goodness. It is the theme of every pen. "There are two books," says that ornament of our profession, Sir Thomas Brown, "from which I collect my divinity. Besides that written one of God, another of his servant Nature, that universal and public manuscript which lies expanded to the eyes of all;" and of which, I may add, our profession opens the page most full of meaning.

I claim for science only a second place. It is applicable only to matters of experience. This is its horizon; and, however it may be enlarged, "it is an horizon still, a circle beyond which, however wide it may be, there shine like fixed stars without a parallax, *eternal problems*, in which the march of intellect never shows any change of place."¹ These problems, gentlemen, will, I trust, commend themselves to you by their intrinsic importance. I may not in this place urge them further upon your attention, than by showing that your studies, if rightly viewed, may fit your minds for receiving the testimony upon which their solution rests, and that the employment of the mind in one department of truth ought to open it, and prepare it for a readier entrance into others. We have the authority of the great master of the Inductive Philosophy for saying, "that any one who rightly considers the subject will find natural science to be, after the Word of God, the surest remedy against superstition, and the most approved support of Faith. She has therefore been wisely bestowed upon Religion as her most faithful attendant, for the one exhibits the will, and the other the power, of God." "Nor," he adds, "was He wrong who observed, 'Ye err, not knowing the Scriptures nor the power of God,' thus uniting in one bond the revelation of His will and the contemplation of His power." The perfecting of this bond—the uniting true religion with the study of his profession—is a subject to which my colleagues and myself would earnestly direct the attention of the student; for, however great hereafter his attainments may be, or however distinguished his future success, these can supply but a part of his daily wants, and will leave a void which can only be filled by the exercise of that hope which is set before us in the Gospel of Christ.

But I may detain you no longer. I have said but little on your individual studies, because I have thought that best left to the Professors in their several departments. I have said nothing of the rewards presented in this Hospital to the industrious student, because I feel that, in every medical school of this metropolis, the object is to encourage industry,

¹ Newspaper Report of the Duke of Argyle's speech at the Meeting of the British Association at Glasgow.

and to reward it. In this, therefore, we strive with others. It is true neither medals nor books are awarded by us, because they are thought to correspond but little to your age, or to the spirit which should animate you. In this school the industrious is rewarded by giving him the best scope for his industry. He is promoted to offices whose duties, well performed, will go far in ensuring him pre-eminence in the future practice of his profession. He has in fact, *more* given him *to do*, and he may find in that a higher reward than in any merely tangible object he could exhibit to his friends.

Gentlemen, there never was a time more propitious to the student entering the profession of Medicine. Its ranks are far from overcrowded, and fields of reward, before closed by private patronage, are now thrown open to public competition. The students of this Hospital have always maintained a distinguished position in such contests, and in the ranks of the profession are well known for their practical knowledge and high character. I have to ask you not to let these honours fade in your hands, but to transmit them with increase to those who shall in future years follow you on these benches. I will assure you, in the name of my colleagues and myself, that no pains will be spared by us to facilitate your work.

[*To the Treasurer.*]

And now, sir, I have only to thank you for your presence here to-day; and, through you, the Governors, for the favour with which they have always regarded our efforts in the cause of Medical Education.

When Guy founded this Hospital, he probably but little contemplated occasions like the present; but, sir, I think you will admit that his benevolent intentions have been greatly promoted by the establishment of this Medical School. The stimulus it affords results in increased advantages to every unfortunate inmate of this house, and has obtained for it a world-wide reputation. To maintain this is the earnest desire of my colleagues and myself, and we shall, I trust, be seconded by your further support.

AN ORATION

DELIVERED BEFORE

THE HUNTERIAN SOCIETY,

FEBRUARY 13TH, 1861.

THE institution of an annual meeting for the delivery of an address bearing the name of Hunter, must have been for the cultivation of that spirit of scientific inquiry which rendered him so distinguished and so worthy of our honour.

Had its purpose been to afford an opportunity for pouring forth laudations to his memory, or for detailing the facts of his personal history, it could scarcely have been thought necessary to repeat so useless a ceremony year by year ; but if, as I have assumed, the intention was to stir up in us the same animus that urged forward the great man whose name this Society bears, then, for such a purpose, an annual meeting is not a too frequent occasion, nor will it, though repeated long after we have passed from these scenes, find our successors with an exhausted theme.

Of all the gifts bestowed upon humanity, none is more precious than the example of a great man, in whatever profession he may arise. He stands before us a revelation of high motives, right methods, and untiring energies, and he carries with him to a higher level all those whose objects are one with his.

Hunter was such to our profession. He was a true believer

in the inexhaustible riches of knowledge which lie as yet undiscovered around us and within us. His thoughts busied themselves upon every living object. "My mind," he said to Abernethy, "is like a bee-hive;" and the remark reveals to us the incessant activity and yet the order of his thoughts. Unwittingly his simile testified that he was in a true position to his work, for, according to Bacon, the true philosopher is like the bee. "Empirics are," he says, "like ants, which collect only for present use, and rationalists, like spiders, weave but flimsy textures out of their own bowels, but the bee gathers material from every flower of the garden and of the field, and converts and digests it by an operation of its own." Hunter might well say, therefore, his mind was like a bee-hive, since into it came observations from every quarter laden with treasures which he was ever occupied in arranging and building up into the structure of science. "Come early to me to-morrow morning, young gentleman," he said to a medical student who had been introduced to him, "and I will put you in the way of things. Come early in the morning, as soon as four, if you can." The appointment was kept, and at that early hour Hunter was found dissecting a beetle!

Medicine and surgery in their practical application refer to man only, but their study embraces a knowledge of almost all physical objects. There are, and perhaps always must be, two views under which the student of medicine will regard man—the empirical and the scientific. It can only be as science reaches perfection that these two views will coincide. At present we are far from such a desirable position, and yet both demand our fullest consideration. To limit ourselves to the one or the other is to act over again the fable of the shield with its gold and silver sides. The practical man, whose life is spent at the bedside, and whose mind is intent upon the diagnosis and treatment of the secondary conditions of disease, and to whom the death or recovery of his patient seems to depend upon a strict limitation of his thoughts to the case before him, feels, as we have all felt under such circumstances, a distaste amounting almost to disgust at any attempt to occupy himself with the purely scientific questions of physiology or pathology. He cannot

but feel that what he wants is not to be gained by a transcendental knowledge of archetypal forms, nor can he readily see that his usefulness is much promoted by devoting himself to tracing up from remote ages or from inorganic atoms the conditions of life, or by occupying himself with whatever subjects if they lie out of his immediate path. Yet it will be generally admitted—and the name of this Society is a sufficient guarantee—that its members especially are convinced that the growth and strength and dignity of our profession depend upon our successfully combating this tendency to an empirical bias, and that whilst the practice of medicine depends upon experience in the strictest sense, it requires the illumination which every light of science can throw upon it.

The one great question which occupied Hunter's mind, is that which will ever recur to us and demand fresh inquiry until its solution is reached, I mean the law or principle of the vital force. It is the chiefest in physiology, and comparable to the law or principal of gravitation in natural philosophy. What is life? Is it something superadded to a peculiar modification of matter, or is this modification of matter so arranged that the principle of life arises out of the arrangement. Between these two ideas fluctuated the mind of Hunter, and we to the present day continue to vacillate between them. Daily advances in science make it more and more probable that organised beings *are the necessary development of the physical conditions of our globe*. The elements of which they are composed are remarkable for their ordinary physical and chemical properties. They are such, indeed, as a knowledge of these properties alone would have led us to select had we proposed to ourselves the construction of a being endowed with ordinary animal capabilities. I do not say that we have any such knowledge of oxygen, hydrogen, nitrogen, carbon, phosphorus and sulphur as would enable us to predict of these substances any relation to the higher animal functions, but only that so far as we do know them, they alone of all the fifty-four elements with which we are acquainted, seem fitted to the organic task assigned them. Surely it is a fact of no small significance that our tissues are so composed. And if we may safely

argue that lime is in our bones to give them resistance, and alkalies in our blood to make it fluid, may we not conclude, though as yet we are not able to penetrate the mystery, that the forces of the nervous system are also the product of its composition. No doubt it must be admitted that we cannot range under the known chemical and physical forces all the phenomena of living beings, nor indeed any of such as are especially distinctive of animal life—as sensibility, and the like; but we know that although the ultimate changes in our nervous system connected with sensation are altogether obscure, yet that the first steps of the process are according to the exactest rules of physics. That we need an optical apparatus of absolute perfection for the concentration and arrangement of the rays of light at the peripheral termination of the optic nerve, suggests that an equally exact though different arrangement of structure exists at its centre. If “physics” prevail at the periphery, then we must infer that “physics” prevail at the centre also, and this may be true to the fullest extent, though the living principle be, as Hunter says, in itself not the least mechanical, neither does it arise from, nor is it in the least connected with, any mechanical principle. For it would be too much to suppose that all the ultimate actions of matter are according to what we now include under mechanical or chemical principles. I think it is a necessary conviction that our knowledge of material actions is in its infancy, and that though we may safely say of any particular series of them that it stands by itself and is not reducible to more common terms, it would be assuming too much to deny such a possibility, and would have the evil effect of making us content with our ignorance.

Suppose it probable that we are not able from the nature of the case to comprehend the ultimate conditions of sensibility or of voluntary action, we are not on this account precluded from inquiring how far these faculties correlate with certain changes in the nervous substance—how far, in fact, an equivalent of material change corresponds with an equivalent of sensorial or volitional change. For example, without knowing anything of an electro-magnet, I mean as to the arrangement of the insulated wire around the soft iron, or of the magnetical properties of the current, I might

yet be able, were all the arrangements totally hidden from me, to make out in all its details the correlation of the chemical change in the battery with the force exhibited in the magnet. And it may be so in the working of our bodies. We may not be able to unravel all the steps, yet we may succeed in showing the essential relation between the extreme terms of the process.

It is but a few years ago that chemists discovered in the vegetable kingdom organic products having a composition identical with the highest that are found in animals. This discovery overturned all the dogmatical assumptions which had previously found favour with physiologists respecting the vital force. It had been maintained that animals alone could form these products, and that they resulted from the operation of some special animal principle. When, therefore, it was shown that vegetables were the great laboratory for their formation, and that animals only assimilated what was so prepared, the suggestion was obvious that we must look for the origin of the vital force, as it regarded animals, in the lower kingdoms of nature. When animals were proved to be so dependent, not only for the materials of their structures, but also for their special arrangement, it was at least probable that this dependence might extend further, and that what still seemed a specific vital principle in them might be but a form of operation of more common forces. Collateral advances in natural philosophy, and especially the views of Professor Grove as to the correlation of the physical forces, which led him to the law that if any kind of force disappears it is only to re-appear in an equivalent of some other force, greatly favoured this probability, and brought new labourers into the field for its support. First of all Dr. Carpenter, in his paper on the mutual relations of the vital and physical forces, directed attention to the *precise relation* which obtains in the lower tribes of animals and in the entire vegetable kingdom, *between the vital activity of each individual and the amount of heat which it receives from external sources*. "Every species," he says, "is adapted to flourish within a certain range of temperature, and that amount of heat which is most effective in sustaining the life of one species, may be injurious, or even fatal, to another.

But within the range which is compatible with the manifestation of its vital powers, we find that the relation is most constant between the *temperature* and the *organising force* exhibited by each species." And according to the same author, on the authority of Boussingault, an annual plant, in arriving at its full development and going through all the processes of flowering and maturation of its seed, *everywhere receives the same amount of solar light and heat*, whether it be grown at the equator or in the temperate zone, its rate of growth being in a precisely direct ratio to the amount it receives in any given time. The plant, therefore, according to such a theory, is a correlative of a certain amount of light and heat—or, in other words, the plant is light and heat exhibited to us as organic vegetable force.

This theory of Dr. Carpenter's, which exhibits to us animal and vegetable life as light and heat acting through certain material substrata and so suppressed in them as to appear in a new form, important as it is as a step in the progress of dynamical physiology, seems to be deficient in not sufficiently recognising the participating activity of the forces of the material substrata themselves, through and upon which the light and heat operate; nor does it account for the formation of organic substances, either as to their origin or their increase. It is to me a matter of regret that I should not be able to name, as the next labourer at this important question, my excellent friend to whom we owe the *Physiological Riddles*. His paper, entitled "*An attempt towards a more extended Induction of the Laws of Light*," though written long since, exists only in manuscript. The views it contains have lately been brought before us by an entirely independent thinker, Professor Le Conte, of South Carolina. Starting from the admitted and almost axiomatic truth that no force in nature is destructible, nor any capable of latency, and that if there seems to be such destruction or latency we are bound to believe it so only in appearance, and to follow up the inquiry until we have found our Proteus under the equivalent of some other force, Le Conte proceeds to place before us, in their relative order, the four planes of material existence,—the elementary; the chemical; the vegetable; and the animal—as in an ascending series, and endeavours to trace the steps

of the process by which the force in one plane may raise the material in it to the plane next above. Though it must be admitted that the proof is often defective, and at the most rises no higher than a reasonable degree of probability, yet the subject is one that must interest the mind of every physical inquirer, and especially of the physiologist.

Matter, it is obvious, may be so arranged in four such ascending planes. On the lower we may place the elementary substances, next above them chemical compounds, on the third vegetables, and on the fourth animals. The extent of these planes diminishes upwards, so far as the amount of the material contained in each is concerned, the vegetable and animal planes containing in them but a comparatively small amount of matter. But as respects the quantity of force contained in each plane, the conditions are reversed. It is this inverse relation of force to the quantity of matter which seems to promise a solution of the hitherto impenetrable mystery of organisation. Matter and force constitute the world, and forces, under certain combinations with matter, appear to be convertible in kind. Chemical action may produce its equivalent of heat, heat its equivalent of electricity, electricity its equivalent of magnetism, and magnetism, in its turn, an equivalent of one of these. The great question therefore arises whether either, or all, or any combination of these forces can change into an equivalent of vegetable organic force, and if this should be proved, whether vegetable organic force can, in its turn, be represented by an equivalent of animal organic force. The whole subject is of the deepest importance to us as medical men. It at least raises the hope that the time may come when this inquiry, reduced to rigid experiment, may elevate physiology to the rank of a demonstrative science. As yet that day must be far distant, but one cannot but rejoice at the prospect of seeing a way of escape from the unsatisfying condition of physiology as it now exists. The last decenniad has seen rapid and almost exhaustive advances in our knowledge of general and minute anatomy, yet it has given us a stone when we asked for bread. Have we not all felt it was but a mockery to tell us the microscopic elements of a tissue or of a fluid, when we sought its nature and purpose? and

to seek to palm upon us a chemical formula, when we wanted the dynamics of the thing? Doubtless such knowledge must have been acquired in order to say to us 'it is not in me.'

The quantity of force which combines the elements of the simplest compound almost exceeds belief. Mr. Faraday so far experimentally determined it for water, as to enable him to assert that the elements of a single grain are held together by an amount of electricity, which, if suddenly set free, would produce the effect of a powerful flash of lightning. Chemistry informs us that the nascent energy of such force is irresistible, and the chemist in his laboratory, taking advantage of it, is able to imitate the operations of nature in the production of organic compounds, and so affords us a further proof that it is not by any new force that nature works in animals and vegetables, but only by a limitation or direction of such as are common to inorganic substances. But it may be asked, How can organic matter be due to chemical affinity, if chemical affinity is, as it notoriously is, its destruction? And has it not always been considered as proved that the conditions of life are in themselves opposed to chemical action, and that the body is unable to resist those chemical actions which come into play as soon as life is extinct? It is on this very ground that the authors I have named take their stand, and seem to prove that whilst chemical action is consuming our textures, it is equally, at the same time, serving to build them up and maintain them.

In the germination of the seed, the oxygen of the air, favoured by the presence of moisture and heat, decomposes the organic material which is laid up around the embryo as food, in the form of starch, and by this decomposition appears to afford a necessary organising force to the germ itself. It is obvious that in germination there are two equal and opposite actions going on at the same time, there is a falling down of carbon from the vegetable plane above to the chemical plane below, and by this fall there is thought to be generated an opposite force, which, acting upon the elements of the embryo, determines its growth. In the after-life of the plant the same processes are in operation, though with opposite results as regards the production of carbonic acid, the agency

of sunlight on the green parts decomposes the carbonic acid, the oxygen falls to the mineral plane, by escaping uncombined into the air, whilst the carbon, becoming fixed in the plant, rises to the organic vegetable plane. If we turn from the vegetable to the animal, we meet with the same operation. Whilst the embryo of the egg develops upwards, a portion of the egg is oxidised, and goes downwards. But here, as in the case of the germinating seed, the amount of force required is comparatively small, since the rise is only from that which is organic to that which is organised. If this view of chemical affinity, as a source of the organising force, be true, it enables us to estimate many, if not all, the common conditions of life very differently from what we have hitherto been able to do. The decarbonisation of the blood by the action of oxygen upon it, though serving for the removal of the production of animal heat and effete materials, may have the higher purpose of yielding force to the blood itself, for the maintenance of its vital state. Our food, which Liebig distributed into two uses, namely, for the nutrition of the body and for the keeping it warm, may have a third upon which the first immediately depends, and indeed the second may, in all probability, minister to the first. This third use is the production of an upward force, as the food, by oxidation, falls into a lower plane. There is something highly suggestive of this in the remarkable fact, that there must be normally within us such an amount of downward chemical action, as may be represented by 32° Fah., for it is worthy of remark that, though our blood is at 100° Fah., 60° Fah. for the surrounding air is temperate, and we feel it neither hot nor cold. This fact, which we bear about us at all times, has hitherto received no attention or explanation, though it seems to suggest the dynamical one I am now speaking of. Nor has it escaped observation that much more food is consumed in tropical climates than would seem to be required, if the only use of it were for the purposes indicated by Liebig; but if, as here suggested, in the consumption of food we have a supply of force for our maintenance, to keep the living tissues in their vital state, then we can understand why, both in temperate and in tropical regions, there are necessities for nutriment not to be

measured by the mere waste of the tissue, nor by external temperature. To carry on the illustration, I may allude to the well-known fact that the exercise of the organs of our body, if within certain limits, leads to their increased growth and strength, whilst on the contrary, disease leads to debility and atrophy. There are obviously several secondary reasons for this, amongst others increased activity produces a larger supply of blood to a part, but probably the chief cause, and that upon which the others are dependent, is the resultant force which, opposed to chemical affinity though produced by it, supplies fresh organising force to the tissue in proportion as its waste is increased. This dynamical view of the vital processes, and of the origin or at least reproduction of organic force, if confirmed by the progress of science, cannot but greatly aid our mere empirical labours, for surely the conviction that all vital phenomena are the expression of common physical force, must quicken our observation of them, and more practically direct our attention to their relation, than could follow from the tacit assumption that they spring from a cause which is in its nature incomprehensible. To us, as practical men, this is of the greatest importance, for the mind soon ceases to be interested in the study of facts to which we have no clue. The inquiries to which I have here alluded, bear only upon the lowest conditions of life, upon the vital arrangement of the elements only, and not upon the organisation of the body into its several tissues and organs. I know of no observations which inform us how it is that out of the homogeneous or apparently homogeneous embryonic substance, there is evolved such a complex arrangement of parts as is presented by the perfect animal. There are, it is true, some faint traces of such polar or opposite effects, such upward and downward tendencies in the processes of organisation, as we have seen to occur in the vitalisation of matter. For instance, atrophy everywhere attends the process of growth in the formation of the body, and gives us the appearance of a special modelling process. Again, as nervous and muscular tissue develop in one direction, so bone and tendon are formed in the other, but beyond these vague indications little is known. To think that we explain the difficulty by saying that these results

are due to a process of differentiation would be to hoodwink ourselves with a word which enables us only to re-state the case in a new form. Differentiation is a learned term applied, and perhaps not very appropriately, only to a series of effects. We might, I think, as well say that the products of decomposition of the dead body are due to a differentiation of it, as that its various textures and organs are the result of a differentiation of the germinal mass. It will therefore be obvious that we gain nothing by the use of the term, at least in the way of explanation of the difficulties of organisation.

However useful and even necessary it may be in the present state of our knowledge to adopt an empirical formula for the phenomena of life, such as that "life is the principal of self-preservation," "the principal of action," that "life is a principle that prevents matter from falling into dissolution," expressions used by Hunter, I think it is certain that it is not through them we shall explain its great problem. It is not by separating organised beings from the conditions which surround them that we can hope to explain the mysteries they present, but by striving so to increase our knowledge, as that they may present themselves to us as necessary correlatives of the conditions out of which they spring, and to which they are in all respects so strictly and wonderfully related. And here I ought perhaps to guard against misapprehension, by remarking that I limit all I have said to the bodily structure and functions, and that I leave out of consideration the conditions of the mind, as being at present no part of our subject. I believe that as men occupied with the study and treatment of disease, we cannot have too strong a conviction that the problems presented to us are physical problems, which perhaps we may never solve, but still admitting of solution only in one way, namely, by regarding them as part of an unbroken series, running up from the lowest elementary conditions of matter to the highest composition of organic structure.

To any one who will take a survey of the progress of medicine, it will be apparent that every step has been gained by clearing away abstract theories of the vital force, and by bringing the vital phenomena into connection with the more

simple forces of nature. There are still, however, in the practical parts of our profession, many remnants of that tendency of the human mind to create independent and self-existent entities out of contingent and variable conditions, which so long obstructed physiology. We hear still of debility as a cause of disease, as if debility were an agent rather than an effect. We still hear diseases spoken of as if they were independent processes ingrafted upon or invading the system. We hear of good and bad constitutions, as if such could be estimated apart from the activities of the several organs of the body. The opprobrium has long been cast upon us, that though we boast ourselves to be practical men, we are yet the most irrational of theorists, that we are extravagant ontologists, separating disease as an independent entity from the person who has it, and assuming as active causes what are but passive effects. It can hardly be maintained that such criticisms are undeserved, and that no evil follows from such language as I have referred to. It must be admitted that debility is now a great "idol of the market," and some not mean authorities have gone so far to support it, as to assert that the human constitution has undergone during the last few years such a change, as that all diseases partake of this mysterious influence. Without suggesting that if this supposed change of constitution were real, we ought to see traces of it in the ordinary growth and strength of the body, in which it is certain there is no falling off, I would observe that in the nature of the case there cannot be strictly speaking a sthenic disease. Life presents essentially two phases, one of nutrition and one of function. Nutrition is a source of strength, function causes its expenditure. The phenomena of acute disease are all those of perverted or exaggerated function; they are all, therefore, due to waste, without the control of that regulating influence, whether in the nervous system or not, which obtains in health. There is no increase, but, on the contrary, a decrease of normal nutrition in acute diseases. We might as well, like children, regard the whirling movements of the hands of a watch whose balance-spring is broken, as evidence of new strength in it, as believe that excessive heat, excessive activity of the heart, rapid breathing, delirium, and

convulsions are proofs of strength. Comparatively they may indeed be so, and by such phenomena we may be able to estimate the previous condition of the patient, but in themselves, so far as his condition is then concerned, they are proofs of rapid disorganising changes. Yet how many victims have there been to the false assumption that they were signs of an excess of strength to be combated by weakening the body.

So far, therefore, as in the treatment of disease we attribute these symptoms to changes which of necessity lead to exhaustion, and so far as we strive to meet them by such conservative means as we possess, I cannot call the observance of debility an idol worship, but, on the contrary, regard it as one of the truest and most important services we can render to our patient. My objections lie rather against the indiscriminate assumption of debility as a condition to be combated without a due estimate of the causes out of which it springs. If vital strength be a resultant of many complex correlated conditions, the variations in it may be traceable to any link in the chain. To put the effect for the cause is a common and dangerous error which perverts our practice. To go no further for an illustration than our too common and sad experience of diphtheria, how often do we blindly prescribe our remedies as against a hypothetical debility, without any regard to the actual condition of the organs involved ; and when the results are unfavourable, it seems rarely to occur to us that we can have failed in any part of the treatment if we have continually striven to counteract the *debility*. Yet the least clinical observation would inform us that our task is by no means so simple as this, that whatever weakening influence may be operating in diphtheria, the causes of a fatal issue may lie in another direction. The function of the kidneys may be so suppressed as to need the vicarious action of the intestine, and purgation may be as necessary on the one hand, as wine or brandy may be on the other. Or, if the exudation extends from the fauces to the larynx, we may be as much called upon to deteriorate it by the use of mercury, as we are to support the action of the heart by stimulants. Debility may plainly arise from causes which are in their nature opposite. The flame of a candle may be dim as well from an accumu-

lation of the unconsumed wick, as from a deficiency of air or oil, which are its stimulus and pabulum. So the body may be weakened by defective excretion as well as by defective nourishment.

If this were a fitting occasion we might pursue the analysis of the causes of debility much further. We might perhaps with some advantage show how many diseases are overlooked by assuming this effect of them, as a cause requiring no investigation. It so easily commends itself to the prejudices of the sick, that they are quite ready to believe the statement that their symptoms, whatever they are, arise from debility. It is a ready explanation of all difficulties, and seems at once to obviate the necessity of any further inquiry. Yet I suppose, as I have just said, that it would be difficult to find a more strange instance of inconsistency than that of a student of nature putting a mere negation in the place of an active efficient cause. But this, I repeat, is an inconsistency justly attributable to us whenever, without inquiry into the conditions which give rise to it, we set up debility as a cause in itself.

I have said that we still hear diseases spoken of as if they were something ingrafted upon the body. In the case of parasites this may be partially true. Worms and epiphytes may represent to us such invading causes. But when a man sickens of a fever, or falls ill of a pneumonia, the matter is by no means so simple. Though we may give the disease a substantive name, it is in reality an adjective disturbance, which can only be rightly understood when viewed in relation to the whole system. This is most obvious in the case of a fever. We may indeed say that a man has a fever, but in reality he is the fever. For the time being he presents us with a new though abnormal phase of life. It is this fever-life that we have to study, and not any substantive disease to be eradicated and cast out. And it is this fever-life in an individual, whose constitution may have been previously healthy or diseased, who may be young or old, who may be living in the town or country, in a temperate or in a tropical region. Can any one with so many variable circumstances before him speak of fever as if, to use a mathematical expression, it were a constant quantity? And can we, by medicating this or that

particular organ, hope to cure a perversion which is universal?

With such thoughts as these in one's mind, how inappropriate seems a large part of the routine treatment to which patients were formerly submitted for correcting the secretions, for subduing local inflammations, and for repressing febrile symptoms, by mercurials, by blisters, and by so-called antiphlogistics. And how much more safely do we conduct our patient through the dangers which beset him, by regarding his whole vital condition, and favouring it by pure air, mean temperature, light nourishment, and moderate stimuli, administering medicines only as occasional aids. This I say of the therapeutics of fever merely by the way, for I am by no means prepared to assert that medicinal measures have always so subordinate a position. On the contrary, they may occupy the first place. What, therefore, I wish by this illustration to maintain is, that it is the object of a sound pathology to associate itself with physiology, since disease can never be anything else than a disturbance of the natural actions of the body.

It has long been established by experience, even when experience was perplexed by such difficult terms as 'sthenic' and 'asthenic,' 'antiphlogistic' and 'tonic,' and when the attention was almost exclusively confined to the local changes produced by disease, that there were cases where these local changes had for the safety of the patient to be overlooked, and his general powers to be maintained. The extension of this principle of treatment is one of the chief steps of advancement made in our day. I say this principle of treatment, for no doubt prior to the cultivation of a more perfect physical diagnosis, and in the hands of those who still neglect physical diagnosis, the same treatment was and is used; yet we can hardly say that there was any principle in it, beyond that of an instinctive feeling of the necessity to keep the patient alive. But the principle of which I speak is, that with our eyes fully open to the presence of acute inflammatory changes in a part, as for example in the lungs or in the heart, we should be prepared, if the nervous system shows any symptoms of excessive disturbance, either in the excited function of the diseased organ, or generally, to abandon all

local indications, and simply support the patient by suitable food and stimuli.

I am not prepared to second to their full extent all the propositions of a late distinguished physician on this important question, nor to defend his treatment to the extent it was sometimes carried ; but I cannot too emphatically assert my conviction that no more dangerous course can be pursued in many acute diseases, than that which is usually called antiphlogistic.

This mischievous tendency to isolate diseases from the conditions of the individual in whom they occur, has been somewhat fostered in modern times by the attempt to apply statistics generally to practical medicine. No doubt if the name of a disease were always of the same value, statistics might be relied on, but since such an assumption is unfounded, they often serve to propagate only error and contradiction.

I might appeal to the experience of anyone, whether it must not be fallacious to take, for instance, a number of cases having such symptoms as, collectively, we term delirium tremens, and put them, without any further analysis, into a statistical table, for the purpose of proving or disproving the value of any particular method of treatment. In one case we may have these symptoms with highly albuminous urine, in another there may be pneumonia ; one may be saturated with spirit from continued drunkenness, and another exhausted from being deprived of his usual stimulus ; one may be in the early stage of his career of intemperance, and still young and strong, whilst another may be so debilitated from advanced degeneration of all his organs as that no possible treatment can avail him. It cannot therefore surprise us, and certainly should not shake our faith in treatment, when we meet with the most contradictory statements respecting this or similar affections. For it must always be so if tables are constructed of cases which are in their nature dissimilar. We have most of us seen cases of delirium tremens which required no other treatment than by purgatives, others where little or nothing was needed beyond an effervescing draught, some where we had more to regard the affection of the kidneys than of the brain, some where opium

was admissible, others in which its administration would have been dangerous ; and yet these differences depend not upon the mere delirium tremens, but upon concomitant circumstances.

This limited view of disease, against which, in the name of this Society, I would raise my voice, is still further favoured by the popular prejudice for specialities, unfortunately too readily responded to by our profession. That a certain division of labour, as well in science as in art, is desirable, needs no proof. But in medicine such division must of necessity be far less strict than that which they who are ignorant of the conditions of life would force upon us. The body is not like a mechanism of human construction, where the parts, though acting in concert, are separable and independent ; for in strictness the body does not consist of parts. The anatomist for the sake of description may call them such, but we might challenge him to give us a line of demarcation between one part and another. Who can treat as a speciality the derangements and diseases of the stomach, whilst its relations and sympathies are so universal ? How can there be a special ' brain doctor,' whilst the functions of the brain are so dependent upon parts the most distant, and influences the most various ? A tumour in the brain may tell of its presence only through disturbance in the stomach, and a disorder of the stomach and its appendages may have for its most prominent symptoms only various disturbances of the brain. Man's body is a system of correlated activities, in which a disturbance at any part may be felt through the whole, and alter the whole. As the poet says,

Each part may call the farthest brother,
And hand with foot hath secret amity.

Hunter was certainly no specialist. As I have before said, he strove earnestly to get an insight into that principle of unity which is the great characteristic of human organisation ; that principle stood before Hunter as a principle of self-preservation, in which he seems to have recognised the essential dependence of the different parts upon each other ; that condition which we express when, as in common language, we call man an ' individual.' To proceed, therefore,

relentlessly to divide him up into systems, organs, and tissues, and to believe that, in so doing, we reach the end of our research, is to stop midway. Here, as in all human inquiries, two processes are necessary, one of analysis, and one of synthesis. We must, of necessity, begin with analysis, and follow it to its utmost limits, but only that we may be enabled to obtain a more complete organic synthesis of our subject. We must separate the components, but only that we may re-combine them into a living unity. Anatomy, histology, and chemistry may enumerate the several *dramatis personæ*, but they can tell us nothing of the characters each may afterwards exhibit in the play of life. The spirit of Hunter would urge us to look at man in every aspect, not only in his individual and perfected relations, but also as a unit in the whole scheme of nature. Led by it, we descend into bygone ages, and trace how gradually organic forms have been evolved, until they have culminated in man. Animated by it, we cannot carelessly regard any effort to explain by what steps the present state of things has been achieved. Nay rather, imperfect as such efforts must be, they all tend to true progress, if they serve to connect man with the conditions which have preceded him, and with those in which he now exists. Not that any inquiry can, in the nature of the case, degrade man into a lower creature, and make him less than he is, for, through whatever process he may have been created—whether, to use the expression of a late writer, he was flashed into being at once from the dust of the earth, or developed more gradually through intermediate forms to be what he is, of necessity presupposes in either case essentially the same operation.

Let us not, therefore, whilst repudiating specialism in medicine as contrary to the true Hunterian spirit, adopt it in our physiology, and separate man from those conditions upon which he is dependent, and from those lower creatures which, if rightly comprehended, may serve to illustrate his being, and exhibit the steps through which it has been perfected. On every side our subject divides itself in two, and demands of us a corresponding extension and limitation of our thoughts. Now we must think of man as part of the common forces of nature, and again as a special individual.

Now we must unravel his textures and separate his different organs, and now we must study them in their combined operation. Now we must consider the inherent force of the germ, and the directive tendencies which are due to it, and then we must turn to a contemplation of the external forces which it assimilates for its extension, its support, and its activity. In disease we must, on the one hand, look at the morbid processes in their relation to healthy nutrition ; and, on the other, concentrate our attention on that which gives them their peculiar morbid character. In therapeutics we must consider both what the local lesion requires, and what is necessary for the constitution as a whole. In aiming at a given result, we must consider that what may seem best absolutely may in any case be relatively worst for the individual, or for the function of any given organ ; that it may be our practical aim to deteriorate the vital processes at one part, in order to favour them at another ; and generally, we must correct our scientific conceptions by the more homely teachings of experience, and counteract the narrowness of these by the wider views of science. On all sides these dual relations claim our attention. Their recognition is the basis of medicine as a scientific art, and this was the character which Hunter strove to give it. But to limit our attention to vital phenomena only, and, especially, further to limit it to the vital phenomena of our own bodies, cannot fail to engender in us all kinds of vicious theories. For how can the mind look with an equal eye upon results in which there is so great a personal interest, and towards which our sympathies are so strongly biassed ? The Hunterian Society is called upon to counteract this weakness, to give medicine its widest scope, and to cultivate it in the most liberal spirit. To use again Hunter's own simile, its members, like so many bees, should be animated by one common instinct of research in every quarter, to gather knowledge for the common good. And beyond all professional aims, our duties bestow upon us unusual privileges ; for, to quote the words of Akenside, Physician to St. Thomas's Hospital, and who lived before Hunter, to us—

The Sire Omnipotent unfolds
The world's harmonious volume, there to read
The transcript of Himself.

CLINICAL OBSERVATION

IN RELATION TO

MEDICINE IN MODERN TIMES.¹

I DEEPLY feel the honour and responsibility which you have put upon me, by placing me here to-day as your exponent of the present position of Clinical Medicine. My task is difficult from the distinguished character of my audience, and from the imperfections of our knowledge in the subject of which I have to speak. I feel, indeed, as one about to undergo the ordeal by fire, the difficulty and delicacy of my task being so great that I dare not hope to escape adverse criticism.

You have been listening to learned discourses on the physics and physiology of living things, wherein the lecturers have been able to instruct and satisfy the mind with details more or less capable of demonstration; whilst I have to admit that my subject lies on the confines of human knowledge, and that too often the highest effort of the clinical student is to arrive at some feeble probability, in the presence of uncertain, or even delusive, evidence.

Clinical medicine, though a special department of knowledge, is so intimately connected with other sciences that when the claims of these are satisfied, it might seem that nothing would remain to it. This appears to me the present error of our schools. It would not, however, be too much

¹ Address delivered at a meeting of the British Medical Association at Oxford, August 7th, 1868.

to assert that, were it possible to conjoin in one human intelligence all that is now known of other sciences, such knowledge would be compatible with entire ignorance of the department of clinical medicine. As the physiologist must yet assert that the phenomena of living tissues are not explained by their chemical composition, or, as the chemist himself has equally to admit, that mere isomerism may be no clue to chemical qualities, so the clinical physician knows that the phenomena of disease are not explained by the knowledge of healthy textures, nor by the action of healthy organs. Clinical work is a work by itself ; and yet, if I may use the comparison, only so far by itself as one form of organic life may be considered separate from another. It stands apart, but has the most intimate relations to all that surrounds it. It is elucidated by the light of physics, chemistry, and physiology, yet is not comprehended by them as they now stand. In ages gone by, Hippocrates had to vindicate the study of disease from the inroads of superstition ; at the present day we have to guard it against assaults on the side of science, and need to watch lest we betray it by accepting a too chemical or physical limit to our thoughts.

We should all contemplate with great satisfaction such inroads of the collateral sciences upon medicine as that at length medicine might have no separate existence ; but this consummation appears to be, as yet, far distant, and must be so acknowledged. Happily, such is the extension of the human mind into nature that almost daily new regions are discovered ; and the boundaries of the old are so extended as to require fresh subdivisions in order to bring them within the domain of thought. Formerly, the physician might have been able to comprehend all that then constituted the allied sciences of medicine ; but that can never again be possible. His duty lies, therefore, in giving an exact and scientific character to the department which remains to him,—to investigate its phenomena with that concentration which is necessary in every physical inquiry, and with all those aids which are afforded in increasing perfection by modern science.

It is not, however, to be overlooked that even Science

herself is apt to have her moments of dogmatism, and, by throwing the light of some particular inquiry full in our eyes, to blind us for the time to that which lies beyond. How often has Medicine been thus diverted from her difficult path ! A discovery in physics has made us for the moment no more than galvanic batteries, or a discovery in chemistry mere oxidising machines. To-day, however, we go to bedside work untrammelled by any exclusive theories of this kind, ready to investigate diseases in every way that investigation is yet possible, and forming our judgment in no narrow spirit of a foregone conclusion. We have no system to satisfy ; no dogmatic opinions to enforce. We have no ignorance to cloak, for we confess it ; but we have to bring into the court of inquiry all possible evidence, and to decide upon it by the light of science and experience. They whose work lies more open to experiment and demonstration are apt to forget the difficulties we have to encounter, and the mental labour required for dealing with them with any measure of success. They would have us postpone these difficulties to a more convenient season, until, by the advancement of other branches of science, their investigation could be undertaken with less risk of failure.

However gratifying and proper this delay might be, were the end of our knowledge contemplation only, and were there no motives to present action, yet, as we are in the midst of human suffering, and have some knowledge for its relief, it is plainly the duty of some, and worthy of the highest intellects, to apply themselves to this work, even though by so doing they may forego the immediate rewards which pure science so liberally affords.

Whilst thus asking for the unstinted recognition of clinical medicine as a scientific department, I am not forgetful of the obligations imposed upon us, nor that in it there lie problems, as yet, far beyond a scientific solution. No one can hope, even as the sciences now stand, and much less as they shall further advance, to obtain a foremost knowledge of them and of medicine at the same time. Yet such knowledge is to us of daily necessity. We must, therefore, refer our physiological difficulties to the physiologist, and our chemical questions to the chemist, and still admit that there remains

an unlimited area of study for us, in tracing the causes and relations, and in recognising the presence, of disease. I would not be understood to say that the physician should neglect the sciences of chemistry and biology, and devote himself to the limited study of morbid phenomena. If any should desire to do so, the attempt would prove its impossibility. The interchangeable relations of things are such as to make necessary the most discursive operations of the mind, if it would successfully enquire into that which is most special. I desire only that that which is our proper work should have our entire energies, strengthened and directed by every collateral aid.

Whilst the biologist traces downwards the relations of the various forms of living things, and, breaking away one by one the barriers of separation between them, at length views them all as springing from a common germ, the student of clinical medicine, working in another direction, seeks opposite results. To him one form of life absorbs and centralises all other forms. His object is to see the facts of human organisation in their most special relations. The very perfection of his work lies in this. It is not even man in general; it is the individual man upon whom his attention has to concentrate. The stock whence he may have sprung, the circumstances of his birth, the time he may have lived, the diseases he may have undergone, the habits he may have acquired, are all subjects to be brought into the focus of thought at the bedside, and made to clear up the problem of disease.

Medicine is a specialism, but of no narrow kind. We have to dissect nature, which for practice is better than to abstract it.¹ Every form of life has to us a value, but in an order the reverse of the generalisations of natural history. We desire to know what limits, specialises, and perverts. We study in order to distinguish, and not to classify.

Yet it is not only the individual that as a whole we have to isolate for the purposes of clinical study; we have further to inquire into the life of his several organs and tissues. These have each their own life, and correlative with it their own tendency to disease and their specific power and mode

¹ 'Nov. Org.'

of repair. To clinical medicine, therefore, the body becomes a pathological museum. In every part we recognise certain proclivities to morbid action; and the purpose of our study is to trace these tendencies to their source on the one hand, and to their effects on the other. Histology and anatomy are daily widening this fundamental department of medicine, and we may be sanguine that an acquaintance with the morbid changes to which the same parts are liable, where present in the lower animals (comparative pathology), will afford further valuable aid, as by it we shall have in some degree a dynamic test of the general tendency to these morbid states, in addition to that furnished by human pathology. A knowledge of these intrinsic tendencies to pathological change in the several organs prepares us beforehand to recognise their occurrence where, without such knowledge, the signs and symptoms which are present would convey no information. To know, for instance, that the brain, from the early period of adult age, in persons otherwise healthy, is prone, without obvious exciting cause, to the formation of tumour in its substance—to be aware of the probability of insidious *ramollissement* of the central commissures in younger subjects—often enables us to suspect these conditions, and to give weight to what might otherwise seem some unimportant ailment. As I name these two instances, I feel sure your clinical reminiscences will supply the proof of what I state, and afford a sad page of suffering, death, and error.

There would appear to be some textures of the body endowed with an almost complete immunity from disease, whilst others are equally liable to it—a difference of which at present we cannot give a sufficient account. Both stand as glaring instances to warn us against the adoption of some of our current theories. For instance, there is, perhaps, no part of the body organised for more rapid cell-life, or that is more extensive or more vascular, than the mucous membrane of the jejunum; yet, with the exception of the choleraic and diphtheritic processes, it is almost exempt from primary organic changes—so much so that at the bedside, in considering the probabilities of disease in the abdomen, we have, on the one hand, to exclude this part from our consideration (except in mechanical obstruction), and on the other to

direct special attention to certain seats of lesion whence the trouble is likely to have sprung. Contrast the limited area presented by the lesser curvature and pyloric region of the stomach, the duodenum, cæcum, and rectum, with the enormous extent of the *valvulæ conniventes*, and compare the frequency and character of the lesions in the one with those of the others, taken together, and it is obvious how much our diagnosis of abdominal disease depends upon our acquaintance with the tendency of certain textures in the abdomen to morbid changes.

The investigations of morbid anatomy have thrown a flood of light upon the so-called acute idiopathic diseases. Formerly such affections were supposed to be of common occurrence; and the treatment of the day was adapted to their apparent violence. But how rarely now do we meet with a case of acute inflammation of the membranes of the brain, or of the peritoneum, or, indeed, of any other texture, which we cannot refer to some chronic lesion, or to some distinct cachexia! the only idiopathic part of the case being that which was formerly overlooked or unrecognised—some chronic tissue-change, unnoticed in the storm of acute disease to which it had given rise.

Oken has said that all the tissues are nervous, and bone is hardened nerve. I need not discuss this assertion on the present occasion; no doubt modern physiology and pathology are advancing the evidence that whatever is living has nerve-quality in it. The highest expression of this quality is conscious intelligence; the lowest it is, from the nature of the case, at present impossible to mark. This much, however, it appears important to recognise clinically—that morbid brain-force may give rise to a variety of disorders, apparently distinct from their original cause. There is a neuropathology from the brain to the tissues, as there is a reverse order of disturbance from the tissues to the brain. If we trace the history of morbid brain-force through the various members of a family, we shall often recognise a great variety of related phenomena, which in nosological classification are separated and considered as distinct. The intellectual disturbance in one may appear as epilepsy in a second; as mere dyspepsia and so-called acidity in a third; in a fourth as

some peculiar neuralgia; in a fifth, if a female, in many varieties of capillary disturbance, such as amenorrhœa, vicarious menstruation, hæmatemesis, or even hæmoptysis; in a sixth, some part of the intestinal tract, the colon chiefly may appear to be the recipient of the morbid nerve-process, and the patient be tortured with fears of a tumour, which, though a mere phantom, is yet calculated to mislead the unwary. Nor does this list exhaust the catalogue of these strange vagaries. It would seem as if sometimes this morbid brain-action expended itself upon the voluntary muscles, which, if of the abdomen, may be shaped into forms that defy diagnosis and bewilder the most cautious.

It might be thought unnecessary for me to point to this strange field of pathology, which has long been recognised as in part connected with hysteria, but I have reason to think our views on the subject are still wanting in distinctness, and that the term 'hysteria,' as now understood, does not include all I here intend. These morbid conditions occur as essentially, if not so frequently, in the male as in the female, though the form of them may be determined by the sex. It would seem that, in different individuals, different portions of grey matter became the seat of the same kind of morbid action; the equivalent of mental disorder in one occurring as some visceral disorder in another, and so on. And, besides these mere functional disturbances, the history of medicine and my own individual experience supply instances of actual tissue-changes which admit of no explanation until thus looked at; and, I need not add, such cases are entirely distinct from feigned and fictitious disorders.

The flatulent dyspepsia of the student, the tears of the distressed, the dry mouth of the anxious, and the jaundice of fright, daily remind us how far the cerebral influence extends, and physiology will hereafter teach us to trace the steps whereby these effects are produced. As there is no explanation of laughter when the axillary nerves are tickled, so there seems to be none of the morbid fears which oppress those who are the subjects of some affections of the colon, and who weary our patience with their doleful complaints. Yet surely we have no more ground to deny the reality of the one than of the other, though we must at present refer

both to some ultimate fact of our natural history. 'As face answereth to face' by mysterious sympathy, so do these and other peripheral impressions excite or depress, in an equally mysterious way, the subjects of them.

I cannot turn from this hasty glance at the idiopathic pathology of the tissues without mentioning how much clinical medicine has gained by recognising the relations of the tissues to time. The wise man says, 'There is a time to be born, and a time to die.' What the physiological limit of the latter may be has not been determined, but at the bedside it has to be recognised and its concomitants distinguished from the phenomena of disease.

Abercrombie was amongst the first to point out that the paralytic affections of age were due to senile changes in the tissues; and more recently the convulsive affections of otherwise healthy but aged people, have been included in the same category. The epileptic attack of the old man is an evidence of failing power, as his paralytic seizure is an evidence of failing tissue. Though the actively growing organs of the child contrast in a striking manner with the same in decay in the old, there is yet, in some respects, a similarity between the diseases of the two periods of life, like the tints of the rising and the setting sun. In the first period the organism has not acquired its forces; in the latter period it is losing them. Infantile convulsions and senile convulsions; infantile diarrhoea and senile diarrhoea; infantile eczema and senile eczema; uric acid deposits in childhood and uric acid deposits in age, may afford illustration of the truth of my statement.

Time, moreover, acting differently upon different parts of our organism, often performs a kind of pathological dissection, exposing the inherent weakness of entire organs, or parts of them, and giving rise to diseases for which at present we have often no name but that which designates some prominent symptom. This process of decay, due to time only, occurs at almost every period of life, according to the constitution of the individual. The fatty degeneration of muscular fibre, occurring in the children of certain families, affords an illustration of this, and we have yet more striking ones in the progressive muscular atrophy,

which occasionally exhibits itself from primary changes in the nervous system, in equally young subjects. Senile changes may thus occur in childhood, as in the ephemera old age comes on in a day. My thoughts have been specially directed to this subject of late, whilst passing in review the facts of locomotor ataxy. The condition of the nervous system which most commonly gives rise to this form of unsteadiness of gait is plainly one of decay, like baldness, or greyness, or the occurrence of the arcus senilis. It occurs to individuals of particular families, in which other forms of nerve-degeneration are prevalent. It is limited almost entirely to males, at the middle or after the middle period of life; and, if we may venture to draw general conclusions from the few observations that have been made post mortem, is connected with fatty degeneration of the posterior columns of the cord; not, however, limited to these, but associated with changes of the like kind in other parts of the cord, and in the brain itself.

My friends Mr. Lockhart Clarke and Dr. Hughlings Jackson¹ endorse the opinion first put forward by Duchenne,

¹ Mr. Lockhart Clarke writes to me that he has long objected to the theory which limits ataxia to lesions of the cord only, and that he has fully stated this in the 'Lancet' of December, 1865, p. 729.

The following letter was written to the 'Lancet' and 'British Medical Journal' on this point, April 22nd, 1868:

Locomotor Ataxy.

SIR,—In my Address in Medicine, delivered at Oxford last week, I there stated that Mr. Lockhart Clarke endorsed the opinion that locomotor ataxy depended upon disease of the spinal cord *only*. This is not so. Mr. Lockhart Clarke, in the 'Lancet' of December 30th, 1865, p. 729, writes thus:—"I object to the practice of speaking of this disease under the term 'degeneration of the posterior columns of the cord,' first because I have found the grey substance more or less affected; and secondly, because the lesions, as we have seen, are not confined to the cord." Mr. Lockhart Clarke adds, in a note to me on this subject, which I have just received, that "Dr. Hughlings Jackson holds the same opinion in this matter as himself; nor," he further adds, "does Dr. Duchenne dissent from it now, whatever may have been the opinion he formerly entertained."

I shall be much obliged by your giving insertion to this note, not only in justice to my friends whose views are here stated, but also as supporting opinions long held in this country, that ataxia is a cerebro-spinal lesion.

I am, Sir, your obedient servant,

WILLIAM W. GULL.

and subsequently maintained by Trousseau, that this locomotor ataxy is due to disease of the spinal marrow only ; but I am disposed to think that they arrived at this opinion against clinical evidence, and perhaps biased unconsciously by prevailing theories of the relation of the nervous centres to each other.

It is only fair to English pathologists here to state that this form of disease has long been known to them. Matthew Baillie regarded it as the most common form of paraplegia, and had an anatomical explanation of its peculiarities which, imperfect as it is, proves that he had investigated its post-mortem anatomy. His theory was that the malady arose from a morbid effusion of cerebro-spinal fluid, which, when the patient was erect, gravitated into the lower part of the theca vertebralis, and, by pressing upon the cord, rendered the patient unable to steady his movements ; whilst, from the same cause, these became free again when he was placed in a recumbent position. I quoted these observations of Baillie in the year 1849,¹ and took occasion then to call the malady encephalic paraplegia. It is probable that this was too restricted a term, as is also that of locomotor ataxy ; and that in our further consideration of the disease we must recognise a diminution of nervous power from failing nutrition of a more general kind as well as special lines of more unequivocal decay, chiefly marked in the posterior columns of the cord. In support of this opinion I may state that ataxy alone occurred but three times in fifty cases referred to by Trousseau. And yet, notwithstanding this, Trousseau drew the characters of the disease which he wished to typify from these three cases, and not from the forty-seven others in which there was evidently disease of parts of the brain, as well as of the cord. If, however, all that has yet been done still leaves the question of the lesion occasioning this form of paralysis in dispute, one suggestive fact remains—namely, the singular isolation of the posterior columns of the cord by the degenerative process. This fact appears to indicate that the affected structures have their own vitality, and probably, therefore, a separate function from that of adjacent parts.

¹ Gulstonian Lect., 1849.

Todd maintained the existence of this separate function on other grounds, and concluded that the posterior columns were mere commissures. This theory seems the more probable from the facts now alluded to, inasmuch as textures fulfilling only such a function may be expected to have a lower vitality than others which are more essential. This supposition is strengthened by what is observed under extreme inanition, it having been proved by the well-known experiments of Chossat that the nervous centres resist atrophy more than other tissues. Related to these intrinsic morbid changes, whether local or general, are the cancerous and tubercular affections, and the universal liability of the tissues to that perverted process of nutrition which we call inflammation. Although, for practical purposes, it is convenient to intensify the differences between cancer, tubercle, and the inflammatory process, we have abundant evidence of intimate relations between them. Thus the children of parents dying of cancer are not rarely tubercular, and those of the third generation are liable to various forms of chronic inflammation; whilst in the same families are healthy individuals, in whom we can discover no evidence of any special morbid tendency. It is not improbable that that which seems most special to us in cancer and tubercle may depend more upon gradation than change of diathesis, and that both are allied to more common degenerations.

In tubercular phthisis this has long been felt and acknowledged. Those who have given most attention to the subject (and I could name no one whose experience would have more weight than that of the late Dr. Addison) have had to confess that the larger their observation, the greater their difficulty in drawing a line of demarcation, limiting tuberculous from simply inflammatory productions. No doubt many of the errors of prognosis in phthisis, some wilful, some unwitting, arise from assuming a distinction which does not exist, except in extreme cases where, as the logicians would say, the *quantum* passes into the *quale*. Although it has been observed that the scrofulous diathesis of early life may show its special characters in age, still we have, on the other side, frequent proof of a change to that which is malignant; and experience will, I am sure, confirm my statement that

the tubercular peritonitis of childhood corresponds with great strictness to the cancerous peritonitis of age. It is probable that cancer is nearer to the simple degradation of tissues than tubercle. It appears to be more independent of an external exciting cause; and although in its structure there is an appearance of vital activity, such activity has no correlation with the healthy organic processes, and is a mere eddying off and separation from the organic cycle. A closer inquiry into the local origin of cancer, and of the mode whereby the system becomes infected by it, are yet desiderata. The tendency to infect the body generally may, after all, not be dependent upon a more marked cancerous diathesis, but upon local circumstances. Something analogous appears to exist in the infecting and non-infecting chancre; for though, according to some authorities, one is essentially local, and the other as essentially infecting, yet it appears certain that even the infecting kind has not always the same infecting power.

In passing from these idiopathic or intrinsic morbid conditions to such as arise from accident or *ab extra*, the fevers chiefly claim our notice. In the consideration of these, smallpox stands first; since through vaccination we have it clearly demonstrated, at least for this one form of fever, and it seems but fair to infer the same of others, that recovery and subsequent immunity are produced by a process of impregnation and assimilation, and not, as is still by some maintained, of elimination. The old theory of depuration, though true of gross chemical poisons, as lead, or mercury, or arsenic, appears to have no application to those operations which take place in the body, in contagious diseases, as the effect of organic poisons. After any one of these the organism is not restored to its former condition, as if any poison had simply been cast out; but there is notoriously a residual and permanent effect, which has been induced under the superficial disorder: this effect being shown by permanent indisposition to a repetition of the same morbid process. Unfortunately for science, the phenomena of fermentation have been assumed in explanation of what takes place under these circumstances; and by the theory of zymosis we are carried back to the days of ignorance, when concoction and matura-

tion were made to explain whatever was obscure. We discover, however, at the bedside nothing in the phenomena of febrile disease proper to zymosis. As well might we call the evolution of the germ after impregnation by that name. The physiological disturbances induced by any one of the fever-poisons—namely, the excess of heat, the rapid waste, the quick action of the heart, the altered functions of secretion and excretion, &c., the so-called symptoms of the disease—are but the outward effects common to the class, and only so far peculiar to each as they may vary in time and intensity. That which really constitutes the specific character of each fever is the attendant tissue-change which, when completed according to the special poison, is followed by convalescence.

It this be in any degree an approach to a true conception of these diseases, it follows that the object of medicine must be rather to limit the violence of attendant symptoms, than, with our present knowledge of therapeutics, to aim at arresting or neutralising their specific processes. Had any one formerly been asked the remedy for smallpox he would hardly have seriously supposed the answer to be the poison of smallpox itself. Yet so it has proved; and from this experience we have learned that help may come precisely in the opposite direction to that looked for in our theories, and we obtain a striking proof of the truth of Bacon's aphorism, "*Natura non nisi parendo vincitur.*"

Yet, notwithstanding this teaching, pathology still persists in looking in another direction; and therapeutics are governed by the idea that disease is an entity which must be combated and cast out. I fancy that the habit of calling these and similar affections blood diseases insensibly fosters the idea of depuration. Now, though I am not disposed to stir up a discussion between *Solidists* and *Humoralists*, I cannot but express my conviction that the susceptibility to the various contagious fevers does not lie in the blood, except so far as it may be a channel through which the poisons reach the tissues; and that it is in these, and especially in the nervous tissues, that the true fever processes begin and end. The facts of habit, such as those of taking opium or using tobacco, the facts of acclimatisation, and of the commoner experience of our life, whereby

the nervous system becomes accustomed and indifferent to continued sources of irritation, render such an opinion the more probable; and a confirmation of it is gained by that enduring effect which ensures against a repetition of morbid actions.

Were I to give liberty to my imagination I might perhaps trace here a much more extensive law of our nervous organisation, whereby that which is new excites, and that which is old becomes indifferent. For my own part, the views which have been put forth as to syphilisation have, on these grounds, seemed to deserve the fullest consideration; and, though I have not original observations to set against the adverse conclusions of some who have made the subject a matter of experimental inquiry, I feel that we cannot easily set aside the experience of those who have asserted its success. Analogy is in its favour.

I cannot conclude these general remarks on some difficulties which now occupy our minds in respect to pathology without alluding to the vexed question of rheumatic fever. Is this state due, or is it not, to a *materies morbi*? Further, have we any grounds for assuming that such *materies morbi* is lactic or acetic acid? I put these questions thus explicitly, because it seems to have been settled upon mere authority that they may both be answered in the affirmative. I say authority alone, not forgetting the experiments which have been made on animals in proof of this theory, since such experiments appear to me to prove only this, that the acids named, entering the blood, may cause endocarditis and some other pathological changes simulating those of rheumatism; but I cannot therein recognise the rheumatic state as I am acquainted with it at the bedside. There are, so far as I know, no analyses of the blood in rheumatism which show that it differs from normal blood in respect of its acidity. The theory of an acid *materies morbi* appears to be supported chiefly upon the excessively acid secretion of the skin in this disease, and the increased acidity of the urine. But neither of these can be considered in any degree characteristic; for not only in the worst forms of the rheumatic process is the secretion of the skin not acid but alkaline, but in conditions of the system totally dissimilar

from rheumatism—as, for instance, in phlebitis, and especially in that form following injuries to the head, as well as in arterial embolism—we often meet with excessive acid sweating, misleading to a false diagnosis those who believe this to be characteristic of rheumatism. Notoriously, a proper function of the skin is to secrete, and probably to form in itself, lactic and acetic acid. Under different kinds of irritation this formation becomes excessive; but I know of no facts to show that this excess indicates a special pathology, or may be regarded as a salutary process, whereby the system is relieved of a *materies morbi*. In so supposing it, we seem to be misled by the same fallacies as, before the time of Sydenham, misled practitioners in the treatment of eruptive diseases. I confess to a strong sympathy with those errors, and though my reason is convinced that they were errors of the most dangerous kind, I cannot but excuse them, and admire the genius and courage of Sydenham, which enabled him to detect and correct them.

If, failing the evidence of the cutaneous secretion, the rheumatologist adduces proof of an acid diathesis from the character of the urine, must not the force of his argument be abated by the admission that urates replace urea in a large number of other morbid conditions, so that we cannot attach any specific value to this fact, the general significance of which will be better appreciated by the physiologist, who will see in the presence of uric acid and the urates a debased condition of organic waste, common to the life of inferior organisms?

To pass, however, from these desultory observations, which the present position of pathology has suggested, the subject of diagnosis claims a few words. We must all admit that diagnosis ultimately rests upon an exhaustive pathology. Without a knowledge of what is possible in disease, diagnosis must be defective, and is, therefore, in that degree defective at the present day, since it is plain that we are unacquainted with many pathological states, if, indeed, we be fully acquainted with any. Moreover a knowledge which seems exhaustive to-day may, in the changing circumstances of the world, be defective to-morrow. Without raising the question whether disease has within

historical periods changed its type, it may be maintained, as was long ago pointed out, that the pathological tendencies of the body do vary with the *genius anni*, as witness the changes in epidemic disease. Within our present experience cholera has afforded us new pathological questions, which are not yet solved; and, strangely, side by side with it—to make the contrast more impressive—diphtheria has revived; laying before us, as if to teach us how feeble our pathological science is, two opposite conditions, two diseased mucous surfaces—one digestive, one respiratory: from the former of which, by mysterious inversion of its normal forces, the salines and water of the blood may be fatally diffused; and from the latter, as by a kind of morbid polarity, the fibrin only poured out.

Although the perfection of diagnosis cannot be reached till we have a perfect pathology, we have to confess that it falls behind the pathological knowledge we at present possess, as the revelations of the post-mortem tables abundantly confirm.

And this brings me to the second principle of diagnosis, a knowledge of the probable in disease. Of this, experience alone can inform us, and experience of the most varied kind. But when so varied, and supported by a large knowledge of pathology, it often enables us, as by prophetic insight, to diagnosticate conditions, which neither direct physical examination nor the most systematic arrangement of symptoms could explain. These suggestions are amongst the best fruits of experience—of that experience which is able to arrive at causes, and from causes anticipate effects. The advancement of diagnosis depends upon the capacity of medicine to make these anticipations with increasing certainty, which, though in a sense *anticipationes mentis*, are truly *interpretationes naturæ*. To illustrate these remarks, what could I better quote than the clinical history of thrombosis and embolism? What mysterious obscurity, until recently, involved the phenomena of which embolism was the cause! but, thanks to Virchow and Kirkes, when once the pregnant fact of embolism in vein or artery is recognised, not only present phenomena arrange themselves in order, but we are able to anticipate the possible occurrence of

others, and by anticipation often to prevent them. Symptoms and physical signs may supply us with abundance of clinical facts ; but, until the one great fact be recognised in such cases, we can make no step in diagnosis.

This instance by no means stands alone ; for wherever, from the nature of the case, we are unable to make a complete physical examination, as must always occur in diseases of the brain, and as too often occurs in diseases of the abdomen, pathological inference, or pathological anticipation, has to supply a meaning to other portions of the evidence. In brain diseases this method of interpretation comes largely into play ; and the neglect of it has much to do with the obscurity in which these diseases are still involved. It is often impossible to form any opinion whatever of the lesion under which a patient with brain disturbance may be labouring from an inquiry, however acute, and however complete, into the mere statical facts, as they at the moment present themselves. The attempt to do so is perhaps more likely to lead to error than to truth ; a fact which, if I be right in the statement of it, shows of how little value mere symptoms are in the diagnosis of such cases.

Abercrombie felt this to its full extent, and one of the objects of his treatise on cerebral disease was to make it clear, and to warn us against future attempts in that direction. A perusal of his writings leaves upon the mind the impression that the most diverse affections of the brain may, at the bedside, present the same symptoms ; that in the most extensive lesions there may be no symptoms at all ; or that the whole catalogue may appear without any lesion. But the feeling of despair which such a perusal formerly produced is now in great part dissipated by the success with which the inquiry can be made in the direction pointed out. Admitting that we shall never diagnosticate cerebral lesions by their symptoms—partly because different lesions produce the same symptoms if the seat be the same ; partly because there appear to be surplusage portions of brain-tissue, as, for instance, in the hemispheres, where lesions cannot make their presence known ; and partly because in that monster disturbance, epilepsy, we have a variety of states simulating organic

lesion,—we betake ourselves again with renewed energy to the study of morbid anatomy and pathology, which first caused the confusion by disturbing our ignorance, feeling assured they will at last afford us a full clue to the difficulty. To a large extent they have already afforded this clue. To begin with the last fallacy I have named, I may remark that we are better acquainted than formerly with the various forms of the epileptic state. A better pathology has prepared us to recognise in this condition a great variety of effects. Todd drew attention to epileptic hemiplegia ; and in the same subjects there occurs also a remarkable form of coma, which has often led to the supposition of effused blood, or tumour, or abscess—suppositions which have been falsified by the recovery of the patient. Whilst our notion of epilepsy included nothing more than a convulsive state with unconsciousness, numerous errors in diagnosis must have occurred from this source alone. It now represents to us a condition of disturbed nerve-force, in which may occur not only the common phenomena of epilepsy, but coma without convulsion, paralysis following convulsion, sudden and transient mania, or an approach to it, as well as, according to Trousseau, some strange forms of neuralgia. A knowledge, therefore, that a patient is liable to epilepsy, or comes of a family in which such a state has occurred, must make us pause in our diagnosis, and thus save us from a precipitate or erroneous conclusion. The proneness of the aged to epilepsy is a fact probably not sufficiently borne in mind in the diagnosis of cerebral disorders. As to the second fallacy, when disease is situated in what may perhaps be called without misuse of the term, the surplusage of the cerebrum or cerebellum, we are often led to suspect its presence, and as often correctly to infer its nature and avoid the third fallacy from a knowledge of the fact of surplusage, and of what is probable under collateral circumstances, though the symptoms of organic disease may be apparently of an insignificant kind. For instance, headache with occasional bilious vomiting in a young and healthy adult—tumour (?) ; the same symptoms, with chronic suppuration about the ear, or in some distant part—abscess (?) ; nearly the same symptoms with syphilitic cachexia—syphilitic affection of the brain (?).

This is the merest outline, but is true to nature. May I say, once for all, that any peculiar shape of head, large or small, has, like the epileptic brain, long been known to increase the difficulties of cerebral diagnosis? Further, how much have we gained in the diagnosis of cerebral disease by the known tendency of renal cachexia to induce chronic or subacute cerebritis, and of embolism to plug the vessels!

In turning from the diseases of the brain to affections of the chest, we find that we are able to combine our knowledge of the possible and the probable with direct physical signs; and consequently the diagnosis of chest affections has very steadily advanced. Old errors, however, still linger even here, and a true dynamic estimate of lung lesions is yet a desideratum. This must be supplied by improved interpretation of physical signs through attendant physiological conditions. The word "phthisis," which has now too often a specific value, will dilate so as to include a whole genus of chronic affections, which, when duly recognised and classified, will afford more secure grounds of prognosis, and spare us the perusal of worthless records of so-called consumption cured.

In the diagnosis of abdominal diseases we want an increase in the number of cardinal facts; such, for instance, as that the enlarged gall-bladder changes its shape by contraction of its muscular coat; or of the two characteristic notches in an enlarged spleen, or of the peculiar position of the colon in enlarged kidney, &c. At present our diagnosis is mostly one of inference, from our knowledge of the liability of the several organs to particular lesions: thus we avoid the error of supposing the presence of mesenteric disease in young women emaciated to the last degree through *hysteric apepsia*,¹ by our knowledge of the latter affection, and by the absence of tubercular disease elsewhere. We infer alcoholic changes in the liver from the aspect of the face, yellowish and mottled by venous stigmata, even without any direct knowledge of the state of the liver or the habits of the patient. We suspect a cancerous disease of

¹ I have ventured to apply this term to the state indicated, in the hope of directing more attention to it.—W. W. G.

the peritoneum in the aged from the pain with ascitic effusion.

It is obviously to an increased perfection of physical diagnosis, aided by pathology, that we must look for the advancement of medicine. The feelings of the patient, the so-called symptoms, are of little value taken by themselves; often, in fact, their mere number and variety are a proof of the absence of disease, and it is admitted on all hands that they need the interpretation of physical inquiry.

The eye, the ear, the touch—and chemistry supplementing the other two senses,—are impressed into our daily service, and we may hope that what the ophthalmoscope has effected for the eye, these other means may do for other parts. To chemistry we owe much; but there are two yet unsatisfied claims clinical medicine has to make upon it. We want analyses of the *residuum* of the urine, in which we may hope to discover new elements for diagnosis; and we further want ready clinical means for recognising what has been discovered by more elaborate processes. Our hope in the direction of chemistry is unlimited, seeing that there must be changes in the urine largely corresponding to the changes in the organs and textures, whether healthy or morbid.

To return, however, to physical diagnosis; the fidelity with which the characters of a disease are often marked in its tissue-changes must excite equally our wonder and attention. It may be no more than the tint of the morbidly vascular part—a condition apparently the most trivial and accidental; and yet it returns with unerring certainty under the like conditions, as our guide to diagnosis. The multiplied generations of the vaccine vesicle from one lymph maintaining to this day, in all respects, the characteristics of that which first arose under the hand of its immortal discoverer, is one of the strongest evidences that I could adduce of such fidelity, and may well encourage us to the investigation of physical signs as an evidence of the pathological causes to which they are due.

But our diagnosis is not always of a single morbid state. There may be grafted upon some special diathesis, as of tubercle or of gout, the effects of alcohol, syphilis, mercury,

or miasm. No doubt even more complicated instances could be given, but this will suffice to show what diagnosis must embrace before we proceed to treatment.

As health is our object, or as near an approach to it as circumstances admit, *hygiene* and *therapeutics* claim the last and highest place in our thoughts. Happily, at this day, hygiene has gained strength enough to maintain an independent position as a science. To know and counteract the causes of disease before they become effective is evidently the triumph of our art; but it will be long before mankind will be wise enough to accept the aid we could give them in this direction. Ignorance of the laws of health and intemperance of all kinds are too powerful for us. Still we shall continue to wage an undying crusade; and truly we may congratulate ourselves that no crusade ever called forth more able and devoted warriors than are thus engaged.

The diseases of the young are in large part preventable diseases.

Epidemics carry off in great proportion the healthy members of a community.

It is futile, if not worse, to speak as some do of leaving diseases to work out their own ends, as agents of a moral police. Medicine allows no such prerogative to our judgment. It is enough for us that diseases prevail, to stimulate our best efforts for their prevention, without our asking a question beyond.

Nothing can stimulate science more to the investigation of therapeutics than the feeling that the diseases calling for treatment prevail in spite of our best efforts to prevent them. Where hygiene fails, properly commences the work of therapeutics; but it is painful to find ourselves occupied in making feeble and often useless efforts to combat the effects of a poison which might perhaps have been stamped out in its beginnings.

The strength of modern therapeutics lies in the clearer perception than formerly of the great truth that diseases are but perverted life-processes, and have for their natural history not only a beginning, but equally a period of culmination and decline.

In *common* inflammatory affections this is now admitted

to be an all but universal law. By time and rest, that innate *vis medicatrix*—

“Which hath an operation more divine
Than breath or pen can give expressure to,”

reduces the perversions back again to the physiological limits, and health is restored. To this beneficent law we owe the maintenance of the form and beauty of our race in the presence of so much that tends to spoil and degrade it. We cannot pass through the crowded streets and alleys of our cities without recognising proofs of this in the children's faces, in spite of all their squalor and misery; and when we remember what this illustration in all its details reveals we may well take heart, even where our work seems most hopeless. The effects of disease may be for a third or fourth generation, but the laws of health are for a thousand. Bearing this in mind, I have often had occasion to remark in practice how little we can estimate the reparative powers, however able we may be to discover disease. This is, perhaps, never more striking than in some chronic affections, which, having resisted all our efforts to cure, may have been abandoned in despair, or at length placed under some indifferent treatment. Under these circumstances, with what interest have most of us day by day watched the lessening deviations of disease until the balance of health has been again all but restored, unstable though the equilibrium thus gained may, from the nature of the case, eventually prove!

Therapeutics were at one time directed only by two ideas—of *strength* and of *weakness*. *Sthenic* and *Asthenic* expressed in general terms the morbid conditions requiring treatment. Of the same import, but of older date, were the thoughts derived from the then current theory of *Phlogiston*; and the terms *Phlogistic* and *Antiphlogistic* still linger in medical treatises. From a better physiology, however, we have learnt that perverted functions in disease, however exaggerated, are due to failure and not to excess of the vital powers.

Organic strength lies nowhere but in the living circle of nutrition and function.

A rapid pulse and active delirium, like the increase of the animal heat, are signs of deficient *balance power*—a power which we have been so slow to recognise in living organisms that we have not yet an accepted expression for it. How different seems to us at the present day the value of the symptoms which were formerly considered indicative of strength!

In an increase of temperature we see but increased waste. Every degree of rise in the thermometer indicates to us a corresponding decline in that nervous control which regulates the functions in health; and this decline is the more important, if it be true in complex organisms as it is in simple machines, that this combination which limits the mere working forces is the highest and most characteristic. The terms "strength" and "weakness" are valueless as expressive of conditions so complicated as those of disease. They are deduced for the most part from the feelings of the patient and a few superficial phenomena. They are empty idols, impressive only by the extent of their emptiness. Surgical treatment was greatly advanced by the imaginary discovery of the *sympathetic powder*, which being placed upon the instrument inflicting the wound, the injured part, by time and rest, was allowed to recover under the simplest means. We need now to import into medicine a large part of the best surgical principles so deduced. The surgeon is contented to place a wounded part under the conditions of physical and physiological rest, and after attention to hygienic conditions, the *res non naturales* of our forefathers, to abide the result. This, no doubt, expresses the largest part of our treatment of common acute disease. We now know that we cannot directly control the morbid processes in pneumonia, pleurisy, or pericarditis; we know, further, that the means formerly considered essential to the cure of these diseases, tested by better clinical observations, were either useless or pernicious; that instead of favouring the plastic processes in inflammation, whereby the normal decline of the disease was promoted, the effused material was often more or less degraded and spoilt by the treatment employed, and remained in the affected parts, either as a foreign body, or in different degrees approaching thereto.

And this must always have been so, had we continued to regard these effusions as simply foreign products ; but as soon as we perceived their physiological relations, and that they had a course of life like the tissues from which they sprung, they took a different aspect, and it became our duty, often without much interference, to stand by and watch this course to the end. With an audience like the present, so capable of supplying the proper safeguards to these expressions, I am not likely to be misunderstood, as if the duties of the physician were of a negative kind. There is a sufficient sphere for our activity in ways too numerous for me to mention : in the relief of symptoms where the lesion may be left to its natural course—in the treatment of the lesion itself, where we have means adapted to it, and of these we may have many—in maintaining the health when the degeneration or lesion is incurable. Time would fail me, if it were otherwise proper in this place, to enumerate and enlarge upon the valuable applications of medicine. The discovery of disease—the alleviation of its symptoms—the obviating its inroads—the placing our patient under favorable conditions to bear it—the guarding him against what would be injurious—and the administration of remedies often in themselves effectual for its removal, are surely services of no unimportant kind.

There is probably no human work which daily confers greater good upon society than does ours ; and when we consider that from the ranks of our profession the chief cultivators of modern sciences have sprung, whether we speak of botany, comparative anatomy, chemistry, physiology, biology, hygiene, or social science, we may feel some justifiable pride and be encouraged in spite of all failures to go on, assured that our future must be one of ever-increasing usefulness and honour.

THE HARVEIAN ORATION.¹

MR. PRESIDENT AND FELLOWS,—“Once in a year there shall be given a solemn oration to commemorate the benefactors of the College, and to encourage its members to search out the secrets of nature by way of experiment.”

This was the express wish of Harvey, and for the annual fulfilment of it he duly provided. It is this occasion which, after more than two centuries, calls us together to-day. Had I not felt it a duty to comply with the request of our President to deliver this oration, I should gladly have put aside the task thus devolving upon me, feeling as I do very deeply the responsibility of undertaking it. But by doing so I felt I should incur greater blame than by failing in a faithful attempt, however feeble, to perform it. To have shrunk from this duty would have involved a seeming unreadiness to do my best, and an apparent neglect of the command of Harvey, whose immortal name confers not only the highest honour upon our country, but an undying distinction upon this College.

We have not met to-day to do honour to Harvey by lauding again the splendour of his discoveries, or to justify the scientific method he employed in making them. This has been done so repeatedly and so well in this place that it would be both superfluous and presumptuous to go over the ground again. My duty is rather to fulfil, as far as lies in my power, Harvey's intention in instituting this oration by moving your minds to a consideration of our position as students of medicine, and to encourage a further search into nature's mysteries.

¹ Delivered at the Royal College of Physicians, London, June 24th, 1870.

The science of medicine, being the science of man (in health and disease), must occupy the central place in human knowledge—physics and metaphysics being the poles of his existence, and the social sciences comprising his history. But it may be asked if our minds are made up as to whether man is altogether an object of scientific study or not; whether the mysteries of his organisation are fairly subjects admitting of investigation; and therefore whether it is becoming in the Harveian orator to stir up your minds to search these mysteries out to their fullest extent. The doubt implied is not one of my own suggesting, for I confess it seems strange to me that any one at this day should assert that “life is a power entirely different from and in no way correlated with matter and its ordinary forces,” and consequently, I may add, no proper object of science. Yet this assertion, though not the inference, comes from one amongst ourselves who is well entitled to respect, and therefore it obliges me to a survey of our present position.

It is not thirty years since it was gravely questioned whether a living body could not generate, by its vital force, some of the elements of which it is composed. An organism was considered to be a creative agent, forming and transmuting the materials of its higher structures. How far the investigations of chemistry have separated us from such fictions I need not remind you; for whatever may be thought of the forces exhibited by living beings, no one would now question the origin and nature of their materials. No one at this day would even dare to hint at any transmutation of the organic elements. It appears, however, that we are not yet entirely emancipated from such conceptions; and that there is still wanting a full and implicit belief that the as yet mysterious phenomena of life are correlative with the lower forces in nature. Whilst the advances of chemistry were settling the question of material elements, physics was deeply occupied with the relations of forces. These relations, which had so long engaged and perplexed logical ingenuity, still remained comparatively barren. Cause and effect were to the logician but invariable sequences, of which he could give no account. To the physicist they now became essential continuities: effect was cause in a new form; suppression

and reappearance took the place of mere physical sequence. The stone which logic offered became bread in the hand of science. A boundless vista at once opened before the mind ; and, instead of isolated and independent phenomena, the essential relations of all the physical forces became more or less clearly discernible, rendering it probable that as a mechanical cause in its simplest form is evolved into its effect by suppression, or as the higher forms of force, heat, light, electricity, and magnetism, could be equally evolved under suitable material conditions from a merely mechanical cause by a similar suppression, so might the organic processes in their entirety be equally correlative of the lower forces. That as the living body neither formed nor transmuted its material elements, neither was it the creative centre of an immaterial and independent organic law working within.

If, in fine, it is ascertained beyond all doubt that, in respect of its materials, a living body contains no more than it has received ; that, however strange and mysterious its organs and their functions, the warp and woof are of substances with which we are acquainted under simpler conditions, cannot the same be maintained of the form and forces it exhibits ?

To begin with the lowest series of living things. There will probably be no hesitation in admitting that the vegetable kingdom is no more than an expression in a higher form of the terrestrial conditions which even common experience proves to be in a general way necessary to vegetable life. And this admission will be freely made, though the infinite details it includes have yet to be made known. Thus the fulfilment of the Almighty fiat—" Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind "—will be regarded not as the unconditioned effect of an absolute will, but as the working out of that will through means laid open to the investigation of science.

To pass from a lower series to a higher, it will be equally admitted that the animal kingdom is sustained at all points by the vegetable kingdom.

That the forces exhibited in animal functions are those previously stored up in plants by assimilation is a fixed position in physiology, and so far the operation of the law

of life is plain; but as we pass to a consideration of the more intimate modes of it, the difficulties increase, and yet probably they are not essentially greater difficulties than such as have been overcome by the patience and docility of those investigators whom it is my duty to commemorate on this occasion.

It may be objected that there is lurking a kind of *petitio principii* in the supposed relations of simpler forces to their higher forms; that, for the conversion of the former into the latter, it is necessary to postulate material conditions of a certain kind, and that for the organic conversion we must begin with a living body or its germ. That the boast of the physiologist is like the boast of Archimedes. If he wanted a $\pi\omicron\upsilon\tilde{\sigma}\tau\tilde{\omega}$, they require germs or ova and a living body. But it is clear that such an objection has no weight as in favour of a vital force which is not material, since it is abundantly proved that, whatever be the conditions required, they do not generate any power, but only vary the form of it.

They who maintain the hypothesis of a separate vital force independent of the ordinary forces of nature, and which has no essential relation to them, do, by the very terms of the hypothesis, assume that the phenomena in living things are out of the proper range of science, and they consign us to a perpetual mental inactivity and ignorance in that region of knowledge in which above all others man is interested. They seem to abjure that birthright which a learned physiologist has spoken of as our highest inheritance when he says, "Man is not only the most wonderful creature God hath created, in the perfection of his organisation; but most in this, that He hath endowed him with an intellect to understand Himself." "When this height is reached," this same writer adds, "then, and not till then, will man be a perfect monument of the wisdom and power of his Maker, a created being knowing his own existence, and capable of explaining it."¹ An hypothesis like that of a separate vital principle, which demands so much, which stops inquiry at once, making progress impossible by removing the steps by which it could ascend,

¹ Draper's 'Human Physiology,' 1856, p. 25.

should at least have the highest sanctions of our intellect. This, however, seems not to be so ; for, says one of the acutest thinkers,¹ " To a reflecting mind the very fact that the powers peculiar to life *include* cohesion, elasticity, &c., that living matter exhibits these physical properties, would demonstrate that, in the truth of things, they are homogeneous, and that both the classes are but degrees and different dignities of one and the same tendency. For the latter are not subjected to the former as a lever or walking-stick to the muscles ; the more intense life is, the less does *elasticity*, for instance, appear *as* elasticity. It sinks down into the nearest approach to its *physical* form by a series of degrees, from the contraction and elongation of the irritable muscle to the physical hardness of the insensitive nail. The lower powers are *assimilated*, not merely *employed*, and assimilation presupposes the homogeneous nature of the thing assimilated ; else it is a miracle, because it would imply that additional and equal miracle of annihilation. In short, all the impossibilities which the acutest divines have detected in transubstantiation would apply *totidem verbis et syllabis* to that of assimilation, if the objects and the agents were really heterogeneous. Unless, therefore, a thing can exhibit properties which do not belong to it, the very admission that living matter exhibits *physical* properties includes the further admission that those physical or dead properties are in themselves vital in essence, really distinct, but in appearance only different." The impassable chasm between the living and the dead which this hypothesis of a vital force assumes, and then attempts to bridge over, appears to be a human figment, arising out of the mechanical mode by which alone man can work upon material ; but, says Newton,² " the main business of natural philosophy is to ague from phenomena without feigning hypotheses, and to deduce causes from effects until we come to the first cause, which certainly is not mechanical." Science may probably never be able to give an account of the primitive germs of living things, if only because the pri-

¹ Coleridge, 'Hints towards the Formation of a more Comprehensive Theory of Life,' 1848.

² 'Optics,' p. 344, 1718.

meval conditions of the world cannot repeat themselves for our investigation ; but it is not improbable that the conception we form of germs and ova is as faulty as was that of early physiologists respecting the generation of elementary substances by organic bodies, or of that till lately generally entertained, and still entertained by some, respecting the vital forces, as if they were not terrestrial. That living things throw off at times portions of their mass, which become through a definite set of physical relations like the parent from which they sprang, is of common experience ; but whether these masses, germs, or ova, as they may happen to be called, are as limited and specific as we have hitherto regarded them, is the *questio vexata* of the day.

That like should beget like, might *a priori* be inferred from the equality of the conditions. But observation also shows that, the conditions varying, like does not necessarily beget likeness ; and this variation occurs both upwards towards a higher organisation, downwards towards an extinction of it, and divergently towards variety of organic form.

The dogma "omne vivum ex ovo," for the truth of which Harvey so justly contended against the fanciful notions of his age, cannot, perhaps, be now maintained in its integrity. Whether, to use an expression of that day, living things are ever produced automatically—that is, *de novo*—through putrefaction or otherwise, is, like the question of the limitation or universality of the germ power, still a matter upon which opinion is divided ; and if it is my duty on this occasion to exhort you to investigate nature by way of experiment, I must ask you not readily to accept negative conclusions which impose limits where none may really exist.

Still, it must be admitted that it is under the strictest and severest limits that nature does operate. If organisation be automatic, it is so in a deeper and higher, in a wider and stricter sense than the mind of man hath as yet conceived. It is a process of whose beginning we have no knowledge or conception, and the present facts of which must ever make greater and greater demands upon the intellect to fathom them. It is an operation which reaches so far as to include in its last developments an intellectual and a moral

law,—all the infinite organic variety we see around us, and that subtle world we feel within.

The time is passing in which the human mind can remain satisfied to rest under the fetters it has imposed upon itself, or to cherish its own phantasms as if its very existence depended upon them. “Man knows only what he has observed of the course of nature” is the notorious dictum of science, showing the limit and the mode of the acquirement of our knowledge; the limit as wide as nature itself, and the mode but readiness to be taught. Notwithstanding, therefore, the adverse decision of schools and dogmas, science still occupies itself with the possibilities of occasional automatic generation. And that it should be so, let it not raise antagonism in the minds of those whose inquiries lie in another direction, since the infinity of nature may well include facts which at first seem to be antagonistic.

But here, as in all search after truth, we pass between Scylla and Charybdis. On the one hand, we may not incline to those easy systems which satisfy the intellect by explanations which the imagination supposes; neither may we, on the other, give ourselves over to systems of immature science, which, whilst they seem to be carrying us forward, are but revolving us in the narrowest circles of knowledge,—for mind is not mechanical, life is not chemistry, anatomy is not physiology; and I think, as the poet says, that we are not altogether magnetic mockeries. Still, as it has been stated elsewhere, the student of medicine would gladly yield up the department of knowledge in which he labours, to be partitioned amongst the claimants of the collateral sciences of physics and chemistry, if their claim was fairly made out; but, however much we may congratulate our fellow-labourers on the work they have accomplished, we cannot admit that their investigations have as yet approached even the confines of the organic kingdom.

Physiology in the range of animal and vegetable morphology has done much to give us the assurance that the infinite variety of organic forms will be traced to their secondary causes. It may seem but trifling to note how vegetable symmetry is dependent upon the relations of light and moisture, and the circumambient fluids, air or water;

or that leaves and flowers will be regular or not, according to the varying firmness of the stem on which they are supported. But if from these observations we can be carried on to those elaborate arrangements which have been described as so admirable in their intentions as to surpass the utmost ingenuity of man to conceive, we cannot believe that there is a limit to our progress but that which our supineness or pride of intellect imposes upon us. Whilst we accept this encouragement, it is to be remarked that the explanations afforded are chiefly statical or mechanical—that they do not approach the conditions which we are accustomed to regard as in a higher sense vital. Yet, even with respect to these, as was brought before you on a former occasion, science does not shrink from the task of ultimately unveiling their mystery. “To suppose,” says Darwin,¹ “that the eye, with all its inimitable contrivances for adjusting the focus to different distances, for admitting different amounts of light, and for the correction of spherical and chromatic aberration, could have been formed by natural selection, seems, I freely confess, absurd in the highest possible degree. Yet reason tells me that if numerous gradations, from a perfect and complex eye to one very imperfect and simple, each grade being useful to its possessor, can be shown to exist; if, further, the eye does vary ever so slightly, and the variation be inherited, which is certainly the case; and if any variation or modification in the organ be ever useful to an animal under changing conditions of life, then the difficulty of believing that a perfect and complex eye could be formed by natural selection, though insuperable by our imagination, can hardly be considered real.”

Admitting the full force of this reasoning, and though anatomy shows that the elementary eye arises by a simple involution of the integument, the difficulty is that the same, or nearly the same, occurs for the ear; and we have no knowledge which would enable us to predict from such beginning the formation of organs so elaborate as these ultimately become, for that can hardly be called knowledge which but deals with facts by contemplation alone. We cannot be said to have acquired a clue to the idea of organic operations

¹ Darwin ‘On the Origin of Species,’ p. 186.

until we are able to try our knowledge by prediction, and to foretell what must arise under given conditions. Although, however, physiology is obliged to assume the unit of each organ, we cannot survey the relations of organic beings throughout their whole extent without the conviction that we have before us the varied illustrations of one pervading law, reaching from the simple elements to the highest tissues and organs.

Not to occupy time by recapitulating the arguments of the Bridgewater Treatises, which, although written from another point of view, would equally prove this unity, I cannot forbear asking you for one moment to consider again this organisation of our own bodies in relation to the earth we inhabit, and then say if it be otherwise conceivable but as the expression of the highest correlation of these external conditions. But some will reply, "This is admitted, and explained by the direct operation of a Divine Power upon the material, fitting one thing to another—the organ to its function, the sense to its object." Accepting to the full all that could properly be contained in this assertion, it is still to be asked, in the interests of science, that, instead of closing the inquiry, it should, on the contrary, but open it, and quicken and make patient the understanding in our search after the facts by which such results are obtained; for the operation of an infinite wisdom and power in nature does not obviate secondary causes or explain the processes which lie between the extremes of existence. I admit that, as Darwin says, the imagination fails to conceive the means in their operation, and that it would rather avoid the labour of inquiry. But if, in the study of natural phenomena, our choice lies between the inconceivable and the miraculous, there can be no doubt where it must be made. That which is only inconceivable may be made clear by advancement of knowledge; but that which is miraculous supposes agencies above and beyond human knowledge, and therefore makes all labour to investigate it useless and vain.

The feebleness and impatience of the intellect will ever incline us to believe that each advance of knowledge is bringing us near to the point of its consummation. It is so

with every discovery ; and it is well it should be so, otherwise the ardent inquirer might sit down hopeless at the extent and difficulties of the route to be traversed, and of the ascent to be made : still we must beware of accepting any conclusions as final. As I had to remark upon chemistry, that when it reaches the confines of organisation it probably ceases in our living tissues under that form, to appear under some higher correlative—so, no doubt, the same may be said of those molecular conditions with which we are now becoming acquainted. The investigation of the reactions of colloids is doing for organic tissues and functions what chemistry has done for elements and elementary composition ; but how far the explanations thus afforded extend can be determined only by the further progress of knowledge. Whether we are justified in speaking of muscle and nerve as if they had any relation to mere colloid substances, or whether by a knowledge of these we approach nearer to an explanation of nerve-force and its transmission, or to the contraction of muscle, is at least doubtful ; for, notwithstanding the admitted instability of homogeneous substances of complex composition, and the tendency to differentiate in various ways, our knowledge of the evolution of the various tissues and organs of the body from the apparently homogeneous ovum is almost as much beyond scientific comprehension as it was when this oration was instituted. It is still, as Harvey remarked, “as if the whole body (chick) was created by a command to this effect of the Divine Architect : ‘Let there be a similar colourless mass, and let it be divided into parts and made to increase ; and in the meantime, while it is growing, let there be a separation and delineation of parts, and let this be harder and denser and more glistening—that be softer and more coloured : and it was so.’ ” Yet let it be remembered that Harvey felt the same difficulty when he began the study of the motion of the heart. “I found the task,” he says, “so truly arduous, so full of difficulties, that I was almost tempted to think that the motion of the heart was only to be comprehended by God. For I could neither rightly perceive at first when the systole and when the diastole took place, nor when and where dilatation and contraction occurred, by

reason of the rapidity of the motion, which in many animals is accomplished in the twinkling of an eye, coming and going like a flash of lightning: so that the systole presented itself to me now from this point, now from that; the diastole the same: and then everything was reversed, the motions occurring, as it seemed, variously and confusedly together. My mind was, therefore, greatly unsettled; nor did I know what I should myself conclude, nor what believe from others." Yet if Harvey's immortal labours overcame the apparently superhuman difficulties of the circulation, who can doubt that some kindred genius shall hereafter lay open before us the springs of development (evolution)? That this will be done cannot be doubted; for who can draw a limit either in nature or in the understanding, after contemplating the greatness of results, and the simplicity of the factors presented to us in the history of generation? Prior to experience, what could have made such demands upon our belief as that which is daily presented to us in the development of the ovum? From a cell so simple that our minds are baffled by its simplicity in attaching any significance to it whatever, the whole complex organism grows into form and activity. Is it not therefore conceivable, is it not rather by this example suggested, that the higher organic forms which inhabit the world to-day may, by the keen eye of science, be tracked through the dim vista of past time to their equally simple beginnings, varied and modified by the changing circumstances in and around them? Simplicity, as we have proof in these early conditions of the ovum, raises of itself no objections. It is imposed upon the highest as well as on the lowest organisms to have the same homogeneous beginnings; and if, as a modern physiologist¹ says, "a single cell, under appropriate conditions, becomes a man in the space of a few years, there can surely be no difficulty in understanding how, under appropriate conditions, a cell may in the course of untold years, from the same simple beginning, give origin to the human race." Biology teaches us that apparently insignificant forces may work large increments of change when the time of their operation is unlimited. It teaches us that there is a sim-

¹ Herbert Spencer, 'Principles of Biology,' vol. i, p. 350.

plicity in nature greater than the untutored mind could suggest; that the agents are so apparently simple and insignificant that the common sense—or, as remarked, the “common ignorance”—of mankind passes by them without thinking them worthy of attention. But, says Coleridge, to whom I have already referred, “the positions of science must be tried in the jeweller’s scales, not like the mixed commodities of the market on the weigh-bridge of common opinion and vulgar usage.”

Every advancement of science exhibits to us new illustrations of great results from causes apparently the most inefficient. Tyndall has lately shown the probability that the green parts of plants may be formed by the decomposition of carbonic acid, through the mechanical action of light, under favorable conditions; yet what imagination can picture to itself the force of a single vibration of such light, millions of millions of which strike in a second upon the retina, without causing even a sensation, or only the feeblest? But if Tyndall be right, such force repeated, inconceivably small as it is, is sufficient to clothe our forests from spring to spring, and to fill our fields and vineyards with ample store of food. If we cannot as yet dogmatically assert “*ubi vero lumen, ibi quoque vita*,” we do thus by every advance of knowledge more clearly perceive that the physical existence, as well as the intellectual development of living things, was involved in the first fiat, “Let there be light.”

To turn from these considerations to such as more immediately concern us, let me speak now of the progress which has been made in our knowledge of the nervous system.

Since the discovery of the circulation no greater work has probably been done in physiology than that by Marshall Hall when he established the conditions of a reflex nervous action. This unit appears to be the key of the most complex nervous phenomena, if it be not, indeed, an expression of the law which determines the form of the whole. From it physiologists have obtained a clue whereby to track the labyrinths of instinct and habit; for assuming as we must that the mechanical arrangements in the nervous system at periphery and centre are, in their way, as artificial as the optical arrangements of the eye, or the acoustic arrange-

ments in the ear, we can recognise how the instinctive and volitional acts are performed independently of the conscious determination of the individual.

Physiologists have long pointed out that the basis of our volitional acts is instinctive. That the most instructed anatomist has no advantage over the ignorant in directing his voluntary movements, each being guided by the objective intention, and both equally intellectually unconcerned in the steps whereby that intention is fulfilled. Together with these innate arrangements it would appear that habit and education can induce new capacities of a similar kind upon us. From anatomical proof, as well as from actual experience, it would seem that the nervous tissue is highly plastic. Not only is it capable of receiving and registering the impressions made upon it, but of acquiring an instinct for complicated acts.

This, the physical basis of education, and even of morals, though not overlooked, is too little regarded in daily practice. We may therefore congratulate the College that the Gulstonian lecturer of this year has taken up this difficult and important subject, and treated it so ably.

By quitting all abstract considerations, and limiting the inquiry to the secondary conditions upon which depend the mental operations, we open a mine rich in practical wealth. Medicine yet owes it to society to demonstrate more fully those secondary conditions whereby a healthy mental activity may be secured and advanced; for of nothing can we be more certain than that the laws of life, in their unimpeded operation, culminate in the advancing perfection of man—corporeally, intellectually, and morally. But the operation of these laws depends upon common things. Whilst the ignorant have recourse to the supernatural, science asserts that everything, if not traced, is yet traceable to its antecedents; and thus, as the handmaid of religion, proves that what a man soweth, that shall he also reap.

But to return. Whilst lower natures in the organic scale are the immediate subjects of external influences, which act upon and mould them with but little resistance, the reflex nervous actions institute a new order of phenomena, culminating in the intellect and the use of means.

As feeling dawns into sensation the sentient being directs its movements so as to avoid what is injurious, and to attain what is useful, and in that degree resists those disturbances which would modify the equilibrium of non-sentient natures. As sensation grows into perception wider relations for good and for evil disclose themselves, and these higher creatures, in the same proportion, avoid what is unfavorable, or seek, on the contrary, by wider movements, the necessary conditions for their existence. As perception leads to knowledge, and mind develops, means of a higher kind are used, and the intellect obviates or regulates the disturbing conditions, until man becomes cosmopolitan, and greatly independent of the varying forces around him.

He stands, as it has been remarked, at the beginning of a new epoch of existence. His body, moulded by those conditions which have equally acted upon other forms, retains a natural alliance to them, so that the comparative anatomist finds it difficult to place him in a group distinct from *Quadrumana*; but the inner developments of his nature have fixed a gulf between him and the creatures outwardly allied to him, which is immeasurable and impassable. By what steps or processes the perception of sense graduated towards the higher forms of intelligence cannot now be discerned; but when mind began to exercise its prerogative of subduing the earth, it obviously brought the subject of it under a new law of existence. The outward agencies which in the beginning had co-operated to produce mechanical results upon our frame, were now opposed and hindered by the operations of mind, and the equilibrium of our physical condition was maintained in spite of circumstances the most variable. Art controlling nature is but a partial expression of the law of man's existence; but even this separates him from creatures next to him by what I have said is an immeasurable and impassable gulf—immeasurable, because there is no known increment which could multiply knowledge according to sense into knowledge according to reason; impassable, because in the onward course of nature those primeval conditions which have culminated in man cannot be supposed ever to recur. Though, therefore, our outward forms remain, like geologic

strata in the earth, to indicate the forces by which they were originally moulded, they can be considered no measure of the relation we at present stand in to the lower animals. "Man is," to use the words of the writer¹ to whom I am indebted for these suggestions, "a being apart, since he is not influenced by the great laws which irresistibly modify all other organic beings." He is a being who is, in some degree, superior to Nature, inasmuch as he knows how to control and regulate her actions, and to keep himself in harmony with her, not by a change in his body, but by an advance in his mind.

The lower law of nature advances in man to a higher form. It ceases to be mechanical, and becomes intellectual and moral. Force does not now properly balance force, as of individual against individual, and kind against kind, as in the lower natures; but force is properly balanced by right, and right modified by duty. Man is social, as distinct from gregarious; and, in the highest conceptions of that state, would be governed by love rather than by law; for, as we are taught, "love is the fulfilling of the law;" which latter, to use the expression of a friend,² "is as it were latent in love, like an inscription in a fountain, becoming visible only when the stream is dry."

And this brings me to speak of a subject now much under discussion, and which touches *our* duty to society.

We cannot, I think, agree to neglect any means which lie within our power of preventing disease. If a rigid scientific method excludes the consideration of final causes where they are so patent, and I may say prominently set forward, as they seem to us, in organic structures; and if it teaches us that this appearance may be more to human eyes than in the sight of Him who ordereth all things by a wisdom transcending our comprehension; if we may not, in fine, without the charge of temerity, venture to assign the *why* in physical causes, how much more open are we to the charge when we set up ourselves as judges of the moral purposes of disease?

¹ Alfred R. Wallace "On the Origin of Human Races," 'Anthropological Review,' May, 1864.

² 'Man and his Dwelling-place,' chap. vii.

I cannot doubt it is on all sides imperative upon us to limit, and if possible to blot out, all diseases of whatever kind. Who would assume the responsibility of letting a preventable evil fester in society, on a pretence of a knowledge of the divine purposes, or under the pretext that public morality would be thereby promoted? The duty which lies nearest to us must ever have the first claim; and it cannot but be admitted that the nearest duty each man has to his fellow is to save him as far as possible from all injury, even though that injury may arise as the consequence of his own fault. Nor will it be questioned that the cause of morality is more advanced by beneficent interference than by permitting ourselves to stand passively by whilst intemperance and vice work ruin and infect the very fountains of life.

In what way society should work thus to protect itself may involve considerations of the most delicate and difficult kind; but the object no less remains, and the duty of striving to attain it becomes daily more and more imperative. These remarks apply to all diseases which are common to the social state.

It is now universally acknowledged that the art of medicine is all but powerless in controlling the morbid actions set up in the large class of diseases called zymotic. Specifics will no doubt continue to be sought after, but preventive medicine will more largely obtain the suffrages of the best informed members of our profession.

There can be no more saddening task allotted to the physician than that of having to prescribe drugs against agents which he knows will work out their destructive effects to the end, in spite of such means. It may be that there do not exist, nor may ever be formed by art, antidotes to these poisons. But should it be otherwise, my duty at this moment still seems to be clear, that I ought not to stir up your minds to search out *such* secrets of nature. Upon this search already too much time has been wasted, and an incalculable amount of life has been lost. On the contrary, I ought to urge upon the profession the most strenuous and united exertions for limiting the spread of these diseases, if it be not possible to altogether stamp them out; and then,

if hereafter antidotes should be discovered, we may hope the cases will be rare upon which their operation could be tried.

I cannot pass from this subject without congratulating the College that we number amongst ourselves many distinguished labourers in this department of medicine, or without acknowledging the debt we owe to the late Sir James Simpson. No one more earnestly drew attention to the demands of preventive medicine than he did ; and amongst the many claims his memory has upon posterity, there is perhaps none higher than this, that his mind was intent upon the means which might be best calculated to extinguish contagious diseases. It might seem Utopian were I to attempt to foreshadow the results of a perfect preventive medicine and hygiene ; but I may at least say that, followed to their conclusions, they would leave us with a greatly reduced nomenclature of disease.

By drainage of the soil alone, the mortality from pulmonary consumption has been in several places largely reduced. By drainage, as it affects the purity of water-supply, the prevalence of enteric fever has also been greatly limited. And whatever may be the ultimate value of the germ theory of disease, had it done no more than promote the purity of the water-supply to large towns, its good results would have been incalculable. We already owe to it the Metropolitan Drainage Works, the Thames Embankment, the Royal Commission on the Water-supply of Large Towns, the purification of the Thames, and such partial filtration of our drinking-water as the public waterworks-companies cannot avoid.

We have lately been rather blamed for not gratefully and more fully accepting the germ theory of disease ; but to this College the theory is not new, and, I think I may add, has not been proved to be true to the extent its more zealous supporters believe. It will be in the remembrance of many present that in the year 1849 a theory was put forth that epidemic cholera was due to fungi and their germs. Peculiar bodies, it was said, had been found in the rice-water evacuations, and also in the air and drinking waters of the infected localities.

It was confidently asserted that we had substantial facts

in support of the theory, and that it fulfilled the conditions required of being both true and sufficient. This College thought the subject of such moment that a sub-committee was formed from the Cholera Committee of that day for its investigation. The drinking-water of infected places was examined, the air of rooms in which cholera patients were dying was condensed, that it might afford whatever floated in it for examination; dust was collected from cobwebs, window-frames, books, surfaces of exposed food, and every imaginable place, to try it for cholera germs. The rice-water stools and the intestinal evacuations passed in different diseases were scrutinised without stint of labour; but the value of the facts put forth by the promoters of the theory gradually faded under the inquiry. The supposed germs, when really germs (for many shapes had been included in the supposed direful growth), were found to be spores of known harmless fungi and confervæ, of which, if even the startling number of thirty-seven and a half millions should be contained in about two drachms of water, as quoted by Tyndall, from Mr. Dancer's examination, it is probable that the whole or repeated units of such millions might be harmlessly swallowed.

But for the most part the supposed germs were not germs of any kind, but broken scraps of vegetable and animal tissues, spiral vessels from dried horse-dung, hairs, wings, and legs of insects, detrita of dress, and the like. The results were, in fact, entirely negative of any peculiar bodies to which the epidemic disease could be referred.

One general result arrived at at that time, however, agrees with the observation of Tyndall in his recent investigation of dust by a beam of light—viz. that the floating particles in the air are chiefly of an organic nature. This we might have been prepared for, from the specific weight of dried organic material enabling such dust to float, when the heavier inorganic substances would be deposited.

That infectious diseases, as the name imports, spread by emanations from the sick, must have been long known, and that such emanations are of a solid nature we may infer from the fact that they may be dried and conveyed from place to place; but in what state, whether as amorphous

material or as germs, we know no more to-day than was known a thousand years past.

No new fact bearing upon the propagation of contagious diseases has been reached by the recent investigations on dust. We cannot infer that summer catarrh is due to infusoria, because the nasal mucus formed in the disease, and at no other time (?), was found peopled by vibriones, since decomposing mucus is generally populous with these infusorial creatures.

The phenomena of fermentation and putrefaction in dead and decomposing substances afford no explanation of the changes observed in a living body in a fever process. The purulent matter produced in smallpox is not in any way comparable to the yeast plant, growing in fermenting fluids. The microscope shows no forms in variolous pus, which are not contained in other purulent innocuous exudations. It is to be regretted that a confusion in terms has been made. Instead of dust and disease it should rather have been dust and putrefaction, or dust and fermentation, since the relation of dust to disease has not been revealed anywhere in the inquiry. That the air conveys the material causes of infectious diseases from the sick to the healthy is a notorious fact, which had equal force before these inquiries were instituted, though, owing to the exigencies of social intercourse, it is a fact now more neglected than in times of comparative ignorance.

It is difficult to vindicate exactness in progress without seeming to be at the same time a hinderer of it. The onward and the regulating forces of a machine, though not incompatible, but necessary, require the nicest balance. This reflection suggests itself by the way the spread of infectious diseases has been handled. The theories it has given rise to have been so easily put forward as to thereby create distrust. But the spirit of science is no favourer of negations. "Der Geist der stets verneint" finds no greater friend in medicine than in theology. But it will be admitted that no progress can be made by the ready acceptance of every proposition, however distinguished the source from which it emanates. The parasitic origin and nature of epidemics may be true, but it has yet to be proved. As an

hypothesis it admits of proof or disproof, and so has further claim upon the industry of those who have put it forward as a suggestion. Without going to the length which this hypothesis demands, we must admit, however, that we know enough to guide us much further than we have yet gone in the practice of prevention.

To leave these discursions, and in a few words to conclude my task, I would repeat that the distinction of medicine, as a study, lies in its comprehensiveness. The student of physical science admits that he has to deal with but one half of that truth which is expressed in man. The student of medicine cannot so limit himself. The facts of sensation, whether pleasurable or painful; the influence of the mental emotions, whether exciting or depressing; the dominion of the conscience, approving or disapproving, are for him facts due to the operation of laws into which he must inquire. Looked at from the point of view which the student of medicine occupies, these higher facts of man's nature are as essentially parts of one law, and control and modify human existence equally with those lower conditions with which physics alone is concerned. This constitutes the unspeakable difficulty which every student of medicine must feel in the present imperfect state of knowledge. To hold the mind in an equal balance as it passes from the contemplation of the lower facts of our existence to those which characterise the highest claims of our humanity, so as neither to degrade the one nor neglect the other, is one of the highest attainments. What eye is single enough to survey the range of life from the material atoms which build our structures, to those "mighty hopes which make us men," without faltering in the vision, or without confusion of the objects?

Every student exalts and distorts the work upon which he is chiefly occupied. The anatomist with his microscope hopes thereby to fathom the depths of nature, and the student of the pure intellect despises his labours, each arriving at impotent conclusions by not mutually aiding and supporting his fellow-labourer. Yet perhaps the chasm between the two orders of human facts is other than it seems. It may be due to our not seeing that we are not

dealing with *contraries*, but with *opposites* : opposites in the highest sense ; not as if the terms of the one contradicted the terms of the other, but with the assurance that each will be understood by admitting its antithesis. Here, says Herbert Spencer, "we arrive at the barrier which needs to be perpetually pointed out, alike to those who seek materialistic explanations of mental phenomena, and to those who are alarmed lest such explanations should be found. The last class prove by their fear almost as much as the first prove by their hope, that they believe mind may possibly be interpreted in terms of matter, whereas there is not the remotest possibility of so interpreting them."¹

What the student of nature's mysteries always needs to remember is his position as viewing things from his own centre, rather than from *the* centre. What he has chiefly to avoid is that discouragement should not pass into denial. If our difficulties are great, our hope is assured that the organic laws, in their highest conception, correlate with laws of truth, and culminate in that moral nature expressed by the term holiness. Thus, only to those unacquainted with the practice of medicine can it seem strange that, ever occupied as we are with the failures of humanity, the mists of physical and moral disease cannot obscure the brightness of that ideal perfection which the "law of life" casts upon our path.

¹ 'Principles of Psychology,' p. 158.

ADDRESS AS PRESIDENT OF THE CLINICAL SOCIETY, 1871.

GENTLEMEN,—The trust you place in my hands by making me your President awakens in my mind a deep sense of the responsibility I incur in accepting it. If a life devoted to those objects at which this Society aims could give me confidence in the future, I should receive the honour you confer upon me more cheerfully and hopefully than I can now venture to do ; but whoever shall strive to set before himself what has been done in clinical medicine, and foreshadow in his mind what remains to be done and the difficulty of doing it, will be apt to be discouraged rather than elated at the prospect. I fancy the Father of Clinical Medicine must have had somewhat similar thoughts when he selected for his first aphorismal utterances, “ Life is short : experience is fallacious.” I confess, however, that I think these expressions of Hippocrates give more help than could have been given by any protestations of confidence which he might have made respecting himself or his art. If Hippocrates were with us this evening, he might congratulate himself that, however short is the individual life of man, by associations like these it becomes perpetual, and ever young and hopeful ; that, instead of the occasional activity of one mind, we can by a society ensure the increasing and varied co-operation of many minds.

It is one of the most striking characteristics of our time that the individual is less and less, and associated activity more and more. But if the *vita brevis* of the isolated labourer is thus obviated, there arises in place of it the

danger of desultory and undirected exertions, which may be fruitful only of the thorns and thistles of contradictory statements, and as barren of true results as are the limited and often prejudiced observations of a single individual. To counteract this, it will be my duty to ask your earnest co-operation for extending and perfecting the labours of the committees of this Society for the investigation of clinical and therapeutical questions. By our present rules, the president has a right to nominate such committees; but it seems to me that it is his duty to invite any member, according to the bent of his inclination, either to initiate some kind of active inquiry or to co-operate with others in it.

By putting positive questions to Nature we are more likely to find out her secrets than by waiting, however patiently, for her own revelation of them. The more narrowly and positively such questions are framed, the less equivocal will be the reply; however feeble and dubious the response, inaudible perhaps to any single ear, or in characters invisible to any single eye, it may be plain and distinct when repeated over and over again. The aid afforded by such questions and cross-questions, putting Nature, as it were, upon her trial, and winnowing her replies by the exacted methods of research, mental or mechanical, is, as Bacon says, comparable to the lever and the screw in mechanical operations. "If," says he, "men should enter upon mechanical works with naked hands, without the force and assistance of instruments, as they have not hesitated to enter upon the works of the intellect with the naked forces of the mind, small indeed would have been the things they would have been able to accomplish, however earnest and conjoined their efforts. And if," he continues, "to dwell a little longer on this instance, and to look into it as into a glass, we should ask if by chance any sober spectator should see men striving to raise a mighty obelisk without mechanical appliances, would he not say they were demented? But if, so failing, they should be confident of success by increasing their numbers, would he not think they were still more mad? But if they should consult together to make a selection, and to dismiss the weak, and only by

the help of the vigorous should expect to accomplish their object, would he not think they were hopelessly insane? But if further, not content with this, they should establish athletic exercises, and summon all thus prepared for the work, would he not cry out, "These people have gone mad, even with reason and prudence"? And should not we be open to have a similar opprobrium cast upon us if, uniting ourselves into a Clinical Society, we were contented to strive to accomplish the work before us without the assistance of the highest intellectual combinations and methods?

If the existence of this Society, ever recruiting itself, as I trust it will do, with young and devoted labourers, annihilates, as I have said, the first lament of Hippocrates that "life is short," I trust that our work will be so prosecuted that his subsequent statement, "experience is fallacious," may no longer obtain. It is perhaps too much to hope that a growth which is indigenous to our minds, and which has shown so much vitality, should easily be rooted out. Hitherto, from the favouring influence of prejudice and self-love, nothing has equalled the exuberance of this sort of experience; no pernicious practice, no fanciful hypothesis, no unfounded dogma but has been and is fed and maintained by it.

Experience in medicine is fallacious because it is limited and imperfect—limited to the few observations gleaned in some narrow area, limited to some season or short period of time, limited by the prejudice, or interest, or incapacity of the observer, or by defects in his methods of examination; and imperfect through our ignorance of the natural course of events, which leads us to attribute results to some accidental interference on our part rather than to the essential course of things; imperfect also because we are satisfied with that sort of experience which affords satisfaction to ourselves, and supplies some ready explanation to those who are dependent upon us.

It is in the nature of inquiries so complicated as those are with which medicine has to deal that fallacies should at all points beset our path. Perhaps also the sense of doubt arising from the fallacies of experience, which weighed upon the mind of Hippocrates, should, like the whisperings of the

slave in the conqueror's ear at his triumph, be ever present to us, even when our knowledge seems most assured.

In clinical medicine the greatest correction of fallacious experience is a true diagnosis—a diagnosis not only of the anatomical conditions, but such a diagnosis of the forces concerned as shall lay open before us a knowledge of the course events will take. If the momentum and direction of a moving body be known, its course and the results of impediments upon it can be calculated. So if we would obtain any true experience of therapeutical measures, we must of necessity acquaint ourselves with the exact strength and tendency of the forces against which we operate.

What voluminous records are there of cures and means of cure which are as valueless as the rags upon which they are printed! "What pains and expense," says Herschel, "would not the alchemists have been spared by a knowledge of those simple laws of composition and decomposition which now preclude all idea of the attainment of their declared object! What an amount of ingenuity thrown away on the pursuit of the perpetual motion might have been turned to better use if the simplest laws of mechanics had been known and attended to by the inventors of innumerable contrivances destined to that end! What tortures inflicted on patients by imaginary cures of incurable diseases might have been dispensed with had a few simple principles of physiology been earlier recognised! But," he continues, "if the laws of nature, on the one hand, are invincible opponents, on the other they are irresistible auxiliaries: (1) in showing us how to avoid attempting impossibilities; (2) in securing us from important mistakes in attempting what is, in itself, possible, by means either inadequate or actually opposed to the end in view; (3) in enabling us to accomplish our ends in the easiest, shortest, most economical, and most effectual manner; (4) in inducing us to attempt, and enabling us to accomplish, objects which but for such knowledge we should never have thought of undertaking."

It is only through a perfect diagnosis that we can see in what direction therapeutical interference should be attempted. It is true that accident has sometimes aided us

where knowledge has failed ; but it is obviously unbecoming in intellectual creatures to satisfy themselves with such scant and precarious fruits, when by due culture large harvests might be reaped. If, as Herschel says, knowledge saves us from futile and inglorious effort, it widely opens to us ways of success which are closed to ignorance. In the present imperfect state of medicine that success may often be but partial ; but even to that degree the amount of human suffering that may be avoided, and the amount of good that may be obtained, is in the total incalculable.

It would be impertinent if I should attempt to exhibit before you the successes, partial or otherwise, of therapeutics. But I cannot forbear expressing our obligations to the sister science of surgery in all its departments. I assert that I have received as lively intellectual satisfaction, and have been as deeply impressed with the feeling that knowledge is power, whilst witnessing the effects of some surgical operation, as I have in contemplating the highest triumphs of physical or chemical science. It is, perhaps, to be regretted that medicine and surgery have been in any way dissociated. Happily in this Society they are united. What detriment surgery has received from the separation others must say ; but medicine requires constantly quickening by the necessity of that exact anatomical observation which the problems of surgery amply supply.

The tendency in modern medicine to increasing perfection in diagnosis is daily lessening the *hiatus* which has existed between the two branches of study ; and pathological anatomy is largely confirming their identity. Clinical medicine requires ever-increasing exactness in these researches. In the reports with which we shall be favoured from the different members in this session, I feel sure that every effort will be made to give the observations contained in them the highest possible exactness of expression.

This Society has two functions to fulfil : to exhibit the working of the most critical methods of research—to show, in fact, what clinical medicine should be ; and to improve those methods. For myself I am far from believing that he is the best observer who records the greatest number of facts ; but he who has the perception which enables him to

separate the chaff from the wheat—what is essential from what is accidental. In the nature of the case such discrimination must begin somewhere, but *where* must be left to the intellect of the observer, or to the circumstances of his work. Treatises have been written on the laws for the guidance of physical research, but there seems to be but one rule that is universal—namely, that the student should be honest and skilful in the pursuit of truth. Honesty before skill. Then we may hope to go on towards completing the perfection sketched by Shakespeare, who, speaking of the physician, says, “His skill was almost as great as his honesty; had it stretched so far, would have made nature immortal, and death should have play for lack of work.” This law of skill in research, guided by honesty of purpose, we must work out with the best means at our command, ever striving for better. Where the scalpel will not reach, the microscope may reach; where the microscope will not help us, chemistry may help us; where chemistry fails, the refinements of physics may come in; and where these fail, that finer power of the mind which enables us to deduce truth from history may lay open before us the workings of forces too fine even for that scientific exercise of the imagination which has lately been so eloquently commended to us; as we see in those hereditary tendencies to disease which as certainly take effect, and produce results as sharply defined and often as coarsely anatomical, as if their physical causes could be labelled and placed upon the shelves of a museum.

But whilst for the purposes of immediate practice we must occupy ourselves with, and so far be satisfied in completing and perfecting, what we have already gained, a little, and but a little, reflection will be required to convince us how much more than this suffering humanity requires at our hands. What unexplored regions are inviting our attention will be obvious to anyone who will look over the pages of any year-book of facts recording the labours in the different departments of medical knowledge. The perusal will leave upon the mind the sense how little has anywhere been accomplished, and how far the lines of inquiry extend.

To take that commonest of all maladies, phthisis, it may

be said to present a great chaotic field, distinct in nothing but in its mortality, and all but unexplored by science in respect of those steps and processes whereby the fatal issue is reached. The 'Transactions' of this Society already contain some contributions towards a better clinical history of some forms of this disease, and I trust that in each session more may be done towards tracking the earlier history of its different varieties; for if anywhere in physic the principle *principiis obsta* is valuable, it is probably here. I trust, however, I may not be understood as if our records of the coarser phenomena of phthisis were not more than enough. Under the generic term phthisis are included many different maladies; and, if the whole object of medicine were satisfied when these forms had been distinguished, and the popular remedies prescribed, there would be no more to say. But clinical science revolts against this conclusion, and requires a still finer discrimination of the morbid processes in question, with information as to how they begin, and by what means they may be obviated or hindered. There is something very suggestive in seeing one member of a family left in health and strength to old age, whilst all the members of the same family, coming either before or after, fall victims to this disease or its alliances; or in seeing exceptions made to its ravages through the intervention of some diverse pathological state—insanity, epilepsy, or rheumatism. Our clinical knowledge ought to show how this is determined, as from such knowledge prevention might be hoped for.

Or, to turn to another and equally extensive field of research, the large class of vascular degenerations occurring mainly between the ages of forty and sixty. If the processes, near or remote, which bring about these morbid states of the heart and vessels, were more fully elucidated, some part of the chapters which now treat of the diseases of the brain, of the chronic diseases of the lungs, of the liver, and especially of the kidneys, would have to be rewritten.

It seems probable that in a good deal of our clinical pathology we have mistaken the end for the beginning; and, being impressed chiefly by the more prominent, or more easily demonstrable lesion, have regarded it as a cause, when it was but part of another and antecedent state. It

is from clinical study alone that we can learn the beginnings of disease. Often when the gathered clouds of the final storm have filled the atmosphere, it is in vain that we look round to see from what point of the heavens it began. The apparently trifling ailments of to-day may, when we are able rightly to interpret them, foreshadow the coming of much graver events.

For these inquiries private practice affords the only opportunities. The record of individual cases, illustrative of the early traces of pathological change, would be of great value. Perhaps, as a rule, we have looked too exclusively to the wards of our hospitals, and to the records of post-mortem examinations, to teach us our clinical lessons. This Society seems to afford special means for correcting these defects. The opportunities of private practice, if carefully utilised, might soon solve for us many obscure problems. Take, for instance, the onset of infectious diseases. By a more accurate study of this stage, which can rarely occur in hospitals, we might learn through what ways the infection invades the organism, and thus might be enabled, if not to obviate its progress, at least to learn something more of the means for controlling it. But I may not longer detain you with these details. Suffice it to say that any new fact, however apparently useless and disconnected, is worthy of a record. It may be, to use the language of embryology, the *primitive trace* in the development of a new form of thought and knowledge ; or, to alter the simile, its meaning may not appear until the context is discovered. The superstitious worshipper of Islam preserves every scrap of writing, lest by destroying it he might mar a portion of the sacred text. Let each one of us, engaged as we are in amassing materials of knowledge, treasure up every stray fact, convinced that it forms part of a precious record, which if not deciphered now will become legible by some subsequent addition.

As the whole purpose of clinical medicine is the cure or alleviation of disease, the efforts of a Clinical Society can never with success deviate from the prosecution of those practical and primary objects. The advancement of therapeutics in their entirety is the end we aim at. Happily it is no longer necessary to prove that therapeutics and the

administration of drugs are not synonymous. It is an ancient saying in medicine that "nature cures diseases," and we have learned in modern times that both in medicine and surgery it may often be our truest aim to secure our patients from interference until a healthy equilibrium is restored. The doctrine of physiological and mechanical rest in the cure of diseases has vindicated and obtained for itself a permanent position in therapeutics. Every contribution to our 'Transactions' in illustration and maintenance of the doctrine will be valuable. If it often taxes the ingenuity of the surgeon to insure mechanical rest for an injured part, how much higher are the demands made upon our therapeutics to obtain physiological rest, or any degree of it, amidst the perturbations of disease. It seems probable that a large number of acute diseases may be sufficiently treated by following these indications of rest only. Yet the greatest misunderstanding prevails, in our profession as well as with the public, respecting the objects pointed out, as if they were of so trivial a nature as to require no skill or attention; but I might venture to assert that they challenge the exercise of the highest faculties, and still often leave us far from their perfect attainment. I would say that the expression, "Nature cures disease," is both a good and a bad expression. It is a good expression if it represent to our minds, however imperfectly, the principle of compensation which prevails throughout a living body, causing the disturbance of the physiological balance in an organ to be corrected by a correlated change in it, or in some other part; as, for instance, when the fainting heart feebly supplies the brain and the centre of voluntary action failing, the patient falls down, and the circulation is restored. To say that "nature cures disease" is a bad expression if it create in our minds a metaphysical conception, as if there were in us some personal *anima* controlling the operations. The former use of the term is that which we, as a Clinical Society, must ever contend for; and our chief object is to encourage amongst ourselves those researches which show how nature in this sense cures disease, and so have plainly before us the circumstances which should direct and control our interference.

Of equal antiquity with the expression I have just quoted is that more famous one, which must ever be remembered in a Clinical Society, that the two special objects of medicine are *to do good or to do no harm*. The latter alternative has, from Galen downwards, been thought a matter of too easy attainment ; but doing no harm is not always an easy virtue in medicine. I desire on this point to call the attention of the members of the Society to the present state of our practice in regard to many chronic and acute diseases, that we may by improved records learn what is the value of positive treatment in many of these maladies. As to the doing good by the exhibition of remedies, which is the more popular view of therapeutics, I need not say a word to stimulate exertion in this direction. We are all impressed with the importance of the subject ; but it is to be urged that the cases which shall be brought forward to illustrate any treatment, or the effects of any particular drug, shall be so selected as to lead, as far as possible, to positive conclusions.

Gentlemen, I fear I have detained you too long ; yet I cannot forbear expressing a feeling which I am sure is in every mind at this moment, that we ought to be thankful we are enjoying the blessings of peace, which enable us to meet on these occasions to encourage each other in the pursuit of knowledge which we hope may contribute to the welfare and happiness of mankind. I earnestly trust these blessings may long be continued to us. The sure foundation of such a hope must ever lie in the fulfilment of that sentiment of one of our greatest heroes—"England expects every man to do his duty,"—to which I add, in the arts of peace as well as in the circumstance of war.

January 27th, 1871.

ADDRESS AS PRESIDENT OF THE CLINICAL SOCIETY, 1872.

GENTLEMEN,—I shall have to-night to throw myself very much upon the indulgence of the Society in any remarks I may have to make, because I have not had time to dress them in such words as I should desire in order to place them properly before you. Many circumstances, which I need not dwell upon, have prevented my better intention ; but I could not be satisfied to take the chair and assume the honour which you have conferred upon me a second time without some observations. It would not be becoming that I should do so either in respect of the honour you have bestowed upon me or of the work in which we have to engage, since, as president of this Society, I am in some sense your spokesman to the world, concerning the objects we set before us.

Our position is a somewhat peculiar one. We are partially antagonistic to the theologic and the scientific aspects of the world as generally presented to us. We differ in opinion in one sense and, I think, in a very serious sense, from that section of theologians who regard the world as a decaying world—as a world that was once better than it now is ; who believe there was a past, however limited, without disease or death ; who regard the troubles and perils which now exist as the result of antecedents which I shall not now discuss, and which evils we must bear as best we can, with but little hope they will be better, and with the fear that they may be

worse. This is, I think, entirely opposed to the views which, as students of nature, we are obliged to entertain. Whoever will take the least pains to look over the facts of creation may see that this world has always been evolving into that which is higher and better—that it has always had a coming future of good, not having reached perfection, and not, in the present condition of things, approaching it, but ever advancing towards that “far-off divine event.”

Whilst the one set of thinkers regard the world as decaying, we look on it as improving,—improving in all respects in its physical conditions as well as in its moral and intellectual conditions ; and as a society we meet here year by year for working together towards the end which this idea sets before us. We are optimists of nature. We believe—though we rarely see signs of it, and work more by faith than by sight—that this world has, amidst all its diseases and its failures, a law of perfection with its inexhaustible fruits in store for it ; and when we see individual suffering, disease, deformity, or premature death, we regard them as the failures of a law which in our minds we strive to recognise, though its operations are so often frustrated.

Again, believing as I do, that this is the view which we all must entertain—that to-morrow will be better than to-day, and the day after better than that—as in the days of convalescence, when the last are always the best,—still I think we cannot but feel that we are hindered by considerations coming from the side of physical science, and which we owe it to ourselves not to receive as final, considerations which would make us forego that hope which the student of the lower forms in nature is very apt to deny himself. We are prone to think we have now before us all the conditions that are possible in respect of the intellect, and that science has its proper sphere finally marked out for it which cannot be enlarged ; a line beyond which it cannot pass. The student of physiology, however, occupied with facts which cannot be included in our present scientific conceptions, is perhaps better placed than his colleague in the lower physics for the expansion of his ideas, if only in this—that he must believe that the intellect will open for us a wider world beyond, and incommensurable with that which we now consider the scientific,

the limit of which at this moment is the limit of the ponderable and the measurable.

If the early animal inhabitants of this planet could have met in conclave they might well have concluded that there was nothing conceivable beyond their own degree of mental organisation; and could anyone have foreshadowed to such dull intelligences the future mental activity of man, he must have met with an obstinate and sceptical denial. The student of medicine can as little deny the subjective as he can the objective. If he resists the inroads of superstition on the one hand, neither can he admit on the other the limit which scepticism would impose. We are often taunted with being servile worshippers of nature, and yet we are so only in a limited degree. We cannot believe that nature, as thus vaguely expressed, is in the highest sense perfect. Though we are admirers, we are not blind devotees of nature. Nature, as expressed to us in living forms, shows the tendency to perfection, though in many parts the results are imperfect. We are met here to-night in view of such imperfection, and with that as an object for the operations of our intellect.

To turn more especially to the object of our work, the living body, there is no doubt but that it is of the first importance for practice to obtain the largest and truest view of all the bearings of the subject. One of the greatest advances in clinical medicine, and which is daily growing, is the more thorough physiological view of disease. Disease is not now regarded as some independent entity in the body, but as a perversion of those essential life conditions which, when normal, constitute the state of health. We can no longer regard all diseases as grafts on healthy parts. The time is gone by when text-books could teach what I and probably many others here had to learn,—that acute disease may be idiopathic in healthy subjects.

In one sense it might be maintained that there is no such thing as disease. Abstracted from personal care and pain, disease sinks at once into the ordinary course of physical phenomena, and would rank in a far different category from that in which we usually contemplate it. It is well sometimes to look at our facts in such light, to accustom the mind

to other conceptions, although I fear that if we maintained such a position we should hardly be welcome to the sick, and certainly the science of medicine or of cure could not exist. "Skin for skin, what will not a man give for his life?" and every man has to consider, and well to consider, his own personal existence and comfort—a practical view of disease which we medical men cannot too earnestly entertain. Still, as I say, it is well sometimes, for the due enlargement of the conceptions of the mind, to get views beyond that which is merely personal, and to consider that those conditions which we call disease belong to a still larger class of phenomena.

At our present stage of knowledge we have, I am happy to say, travelled a long way beyond the necessity for definitions, or you might perhaps expect from me a definition of disease. I do not, however, think that there is any member of this Society, or of the Pathological Society, or of the Royal Medical Chirurgical Society, that would venture to give such a definition. Disease is not a status, nor a definable condition, but that course of nature in a living thing which is not according to its health. It is, whatever else it may be, such a course of nature for the individual.

This view of disease takes in a beginning, a middle, and an end. We have often to consider conditions afar off in the past to come to a beginning. It is to be remembered that, in present disease, we are sometimes dealing with physiological conditions in a course of nature which may have had distant beginnings. Disease to the ignorant is some present definable entity; something to be searched out and contemplated by itself, and, if need be, attacked and exorcised as might be an evil spirit. This idea has given us a word still extant in medicine, "seizure." But what is a sick man seized by? The old theological notion that an evil spirit entered the sick is gone, though its mark remains, and still imposes upon the mind some part of the popular notion. Seizures, however, there are none, though we still use the word to express the beginnings of disease, and although to the ignorant it still implies something *ab extra* that must be rooted out of the individual as soon as possible.

To the superficial observer, disease is a chaotic concep-

tion ; a chaos of symptoms, to be met at all points with drugs and similar means, to every symptom its remedy. And thereon is even founded a system of medicine. To its disciples disease can, therefore, be only a set of symptoms ; but to the students of a truer medical science the causes of the symptoms are the objects of contemplation. We require a history, and not a definition of disease.

I said just now that by anyone whose notions of disease were duly corrected, many states of the body formerly regarded as disease could not now be so considered. But such errors do still obtain in the practice of our profession.

It may be fairly said that there are some people who, without having any disease, are born to suffer. Under the present conditions of sublunary things they cannot maintain a healthy equilibrium. They are always ailing. Medicine fails on such. Unstable health is their law, in spite of the contents of the Pharmacopœia. In practical medicine it is important to recognise these sufferers. The same remarks apply equally to the conditions of age, and this at various periods of life.

Of tissues, as of the whole man, it may be said there is a time to be born and a time to die, but for different individuals this cannot well be determined, and at least the diagnosis is difficult. Yet I may appeal to my hearers if they cannot recall cases where they have prescribed all the farrago of tonics, with as good a purpose and result as if they would thereby strive to prevent the setting of the sun. I repeat, there are states too hastily regarded as disease, which are to the individual his normal existence. Such are the peculiarities of some persons when measured by the cases of others. Such are the normal senile changes of the body. Such, too, are the abnormal senile changes produced by disease. For in many diseases there comes a time when the conditions undergo change, and we get a new order, not strictly dependent upon that which preceded ; as, for instance, syphilis may cease to exhibit its proper effects, and may have produced such a general influence on the nutrition as to lead to early decay,—syphilis ceasing as syphilis, but leaving decay in its stead. Thus the problems with which we have to deal may change, even as we are

occupied in their solution, and that which we have to deal with in the end may be entirely different from that with which we began. Iodide of potassium, for instance, may cure a syphilis, but the cachexia of the organism caused by the syphilis and its remedies may never be cured, but may advance in spite of all specifics, being no more a disease than the decay of advanced age is disease.

Now let us consider the extent of our work,—all the disturbing influences and the various morbid agencies that act upon our organism. I sometimes think that if, instead of covering these walls with books which are but little read, we were to emblazon them with a catalogue of all the morbid agents and agencies which may disturb our health, from the itch insect to the typhoid poison, the gain would be great. I am old enough to know—I am not sure that there may not be others here who may remember also—that itch was once considered to be a constitutional disease! I know those who believe now that pityriasis versicolor may depend upon hepatic or uterine disorder! Our supposed knowledge of other diseases may, though unsuspected, be equally at fault.

To know in exact detail the lines of morbid action and seats of the primary operation of morbid causes would be of incalculable worth to us: Upon what tissue, for instance, does the scarlet fever poison first operate? “Oh,” it will be said, “upon the blood.” But this may be very much doubted. It is more than doubtful if the blood be affected directly by the poison of this and other fevers. Many organs with which the blood has most to do show no change. Look at the voluntary muscles: they receive much blood, but do not primarily go wrong. Look at the choroid and other deep vascular tissues of the eye, which, however richly supplied with blood, do not get particularly involved in the early phenomena of scarlet fever. It may be much doubted whether our notions about the blood are not very vague, and I must appeal to the members of this Society to help to improve our knowledge on these points; to help us, in respect of the primary operation of morbid poisons, to determine upon what tissues they first act, and what is the first effect of their operation. Their entry and exit from the blood may be but

indifferent facts. Probably, and almost certainly, they do pass through persons indifferent to their operation. What we want to know in clinical medicine is where, according to their kind, they act. We may know where pityriasis versicolor begins, and how it limits its operations; but we do not know when and where the poison of scarlet fever first begins to rankle, or when or how the poison of smallpox first begins its fatal work.

There is much hope that comparative pathology will teach us something on this and kindred subjects. We are learning that there are parts in us more and other than we individually want, and without which we should be no losers—the relicts of our ancestral relations. Other organisms may have needed parts which may be superfluous and even injurious to us. A perfected comparative anatomy and pathology may teach us more on this. Probably coming, as it seems we have, through a long line of dissimilar ancestry, there may have been entailed upon us elements not especially needful or useful. This opens an inquiry whether, if there be such parts or organs, they may not be, from their very nature, the more liable to disease, since those parts whose functions are least definite are apt to be the foci of pathological changes. Every pathologist will bear me out in the assertion that malformed parts are common seats of disease. Instance the cancer of undescended testicle. Again, the vitelline duct in the ovum of man, considering the size of the ovum, must have but a microscopic function, and it may be that the vitellus is but the relictum of the ovipara. But however it be, I do not suppose its function in man is great, either in respect of time or space; and certainly for the most part the vitello-intestinal duct is as transient as we may suppose its importance to be slight. Still it sometimes persists and grows with the intestine, giving rise to a large and by no means unimportant diverticulum of the ileum. Our museums contain frequent instances of this, and there happens to be in the museum at Guy's a diverticulum in a full-grown state, retaining its connection with the umbilicus. This was taken from the body of a young man aged thirty-six, who had enjoyed perfect health until his fatal illness, which was due to this superfluity. Owing to cold, or some such cir-

cumstance, an irregular peristalsis of the intestines twisted them round this useless part and set up fatal obstruction, so that to him was applicable, with a change of a word, the epitaph on Burton, the author of 'The Anatomy of Melancholy,' and I requested it might be thus recorded :—"Cui vitam et mortem dedit diverticulum." How much longer and happier perhaps would have been this man's life had his oviparous ancestry not entailed this vitellus and its duct upon him ! Perhaps my illustration may admit of critical objections, but there still remains the suggestion that an advanced comparative anatomy and pathology may show that there are some organs in us without which, as individuals, we might be much better off. These sciences may tell us more of the vital history of different organs and tissues, for, like bees, we must go far afield in these regions for our honey, and gather from every source of knowledge, returning home to study the special life and function of every fibre and organ.

A great nature philosopher (Oken) has said that every part of the body is nerve—that bone is hardened nerve. Whether this view be extravagant or not I will not stop to discuss, since we must believe that the elements of the groups of the different textures are living—that each has its own biology and pathology. The history of the process of life, from the primitive trace in the ovum to the last breath of age, is a series of illustrations of textural growth and decay ; impressing upon us the truth that, however necessary it may be to obtain general conceptions of the organic law as a whole, it is only by the most special study that we can pursue the objects which medicine proposes. The history of whole organs in us confirms this truth. Could the early foetus feel and reason upon its existence, what would be its disquiet at the apparently revolutionary changes at work in its structures—atrophy everywhere side by side with growth,—until, in ignorance, it might desire to forestall and hinder the organic laws. These are fanciful speculations, but may bear upon our ignorance at a more advanced stage. It is to be hoped that the new hospital now established in London for comparative pathology will afford us a larger knowledge of the diseases of the different

tissues and organs in the animal series, and will show us the natural history of disease, not only on a larger scale, but with a truer appreciation than we could gain if our observations were limited to the human body alone. For if we are to operate successfully on living things, we must be largely informed as to the full meaning, not alone of the whole individual, but of his minutest parts.

So far for the general scope of clinical work, a due estimate of which bears directly on diagnosis, since the eye sees no more than it brings with it the power of seeing ; and as diagnosis is the basis of practice, it must be laid four-square to every aspect of knowledge.

Improvement in physical diagnosis must always be an object immediately dear to a Clinical Society, and yet it is often, and for the most part, however it may be perfected, only the preliminary process to sound practice. Upon the exactest mechanical diagnosis must follow the intellectual determination of the vital conditions, and of the possible and the impossible. It may be granted that the practically possible and impossible are changing, and that our efforts are to destroy the latter. Still there is always a practical impossible, and in relation to disease we have always to make such a diagnosis as shall show what we can and what we cannot effect. Perhaps it would be well if members of this Society would bring before it some illustrations of the impossible as well as of the possible. It would tend to prevent us from making foolish, because ignorant, attempts to do that which cannot be accomplished ; attempts which only result in loss and hurt to the individual. As a practical profession this is not an unimportant consideration. I remember my friend Dr. Acland, the present Regius Professor of Medicine at the University of Oxford, saying to me that he would have engraved round the Radcliffe Infirmary the saying of Trophilus the Ephesian, " He is the best physician who knows what is possible and impossible." The negative results of such a mental exercise are by no means indifferent if one may judge by the results which are often seen in the treatment of chronic incurable disease, where the small remnant of life is wasted in futile and painful efforts at cure. And in the same category are the

attempts at the impossible upon those unfortunate members of the human family who are born with a feeble vital capacity; delicate women, for instance, who, if I may say so, have no more stature of strength than falls to the lot of a canary, and yet upon whom we try, how vainly! all the chemistry of tonics. A friend of mine once consulting me on such an instance, I could not refrain saying to him, "Do you know what you are trying to do? You are trying to put a quart measure into a pint." He replied, "I have been giving strengthening medicines to this patient for years. I have exhausted every means, and yet she is ailing—always ailing." I saw the other day an advertisement inviting persons of short stature to come and be made tall, and with the promise that any defects of height could be duly rectified—a proposition not much more absurd than that we are expected to meet promptly, by a prescription of iron or quinine, for every sort of debility that may come before us. As our business is not knavery, but knowledge, it is clear that the diagnosis of the possible and the impossible is of the first importance, that we may not waste words and efforts on useless pursuits.

On physical diagnosis I shall not detain you. All are fully alive to the importance of advancing physical diagnosis to the fullest perfection. Therefore, when any new means or increased exactness of the old means of physical diagnosis is discovered, this Society cannot but hail it with delight, even though it may throw us for a time into doubt and confusion. Such is the state of thermometric knowledge at the present moment. I have more than once been tempted to lay aside my thermometer because it has contradicted my clinical knowledge. But it must be so at first with all new evidence; it takes time to bring it fairly into court.

But that vital diagnosis to which I have alluded, and which weights and measures, however refined, cannot give us, comes from experience. Take, for instance, such an eruptive fever as smallpox. From its outset its future can be predicted, if not as to intensity, at least as to character and duration. Well might the poet insist, and chiefly it is true in clinical medicine, that "*per causas scire est vere scire.*" That which, in contrast with mechanical diagnosis, may be

called vital diagnosis, is the last important object at which this Society aims. What our actual knowledge on this is may be illustrated by reference to the diagnosis of pneumonia. The mechanical diagnosis of pneumonia is familiar through physical signs, but how far from exact practice does this land us! For prognosis and treatment we need a deeper insight. Some forms of pneumonia will, we know with certainty, clear up in seven days, whilst others will never clear up at all, although both may begin much alike. One has, to use a former expression, a beginning, a middle, and an end; the other has but a beginning. What are the grounds for a true discrimination of each and of all the intermediate gradations, and of that form which, as I have said, has but a beginning with no other ending but death? What are the invariable facts which shall tell us why this case degenerates into a form of phthisis, going on in a variable degree for years, whilst that shall run its course more quickly, killing the patient in a few weeks or months? We know, as the logicians say, the differentiae of common inflammation and the various forms of specific inflammation—rheumatic, syphilitic, gouty,—all of which are modes of vital diagnosis. If we put the word aright upon them we adapt the treatment accordingly; but of pneumonia we have no such exact diagnosis, and I speak of pneumonia since the pulmonary system equals in a sense the systemic. It cannot be doubted that the tissues of the lung undergo a great variety of changes, having different vital qualities. The dynamics from the beginning are different, though difficult or impossible to distinguish. On the skin we can better distinguish, but not yet so accurately as we ought. It is too often but a general distinction, as of eczematous affections from leprous affections, and of papular from both; but in pneumonia and pleurisy, renal diseases, and other internal affections we have often not even this accuracy of vital diagnosis, and therefore I call upon this Society to perfect it. The conditions of physical diagnosis are imperfect, but those of vital diagnosis are much more so.

Lately you are aware I have been called upon to make a diagnosis of the finest kind—of the working of the function of the brain as expressed in the mind;—not to diagnosticate

a tumour, a ramollissement, a degeneration of the brain, but to test its moral and intellectual dynamics. There is often encountered a prejudice at the outset of such an inquiry from the taunt that the doctors assert that such and such a person is insane because he has committed a crime. But permit me for a moment to point out that we judge of the previous strength of any material by the strain it will bear. Should it break under the test it would be absurd to maintain it could not have been weak or imperfect beforehand; and may not the first evidence of mental and moral defect be due to some stress of circumstances, often exaggerated and distorted, which is put upon the brain, and that breakdown which in one would be crime becomes in another the first sign of insanity? In the defects and diseases of other organs this is a matter of the tritest experience. How often does aortic or mitral imperfection first become known by some sudden exertion! yet who would on that account deny the previous weakness? The beginnings of disease are, as a rule, latent and obscure, and discover themselves only when some strain is put upon the weak part. Illustrations of this are at hand on all sides, whether in the heart, the lungs, the abdomen, or the brain. It was only our ignorance which led us formerly to believe in acute idiopathic disease in healthy subjects, and it is probably equally so with nervous conditions, and with the mind. There are, doubtless, many persons living uneventful lives who maintain a sane equilibrium until influenced by some circumstance, real or imaginary, and who then at once show their weakness; and yet from the high seat of justice we often hear the objection put forth as an argument that therefore the patient was sound because there was no sign of insanity beforehand. But the sign of unsoundness may be what has occurred. I am sure we, as clinical students, have our minds perfectly alive to this; and although some of the most learned and practical men in our profession maintain that the diagnosis of the intellectual and moral status is an inquiry we ought not to take up, and that the common sense of man fits every one equally to make this diagnosis with the most accomplished physician, I cannot think so: and if it be a fact it must not remain so, for it would be

unworthy of us to leave uncultivated a field of inquiry so important to us all. *Medici sumus, humani nihil nobis alienum esse putamus.* As medical men we know of tendencies to latent insanity without the least overt evidence of their existence; minds which on a strain will certainly give way. We know this as well as we know of weak and imperfect hearts or other viscera, which perform their functions fairly until called upon to meet some extra demand, and then they fail altogether. The onset of acute disorders of mind or body, to use a common expression, by no means coincides with the date of their causes. This is so well established in medicine that we go back upon a latent cause from the occurrence of acute effects, feeling assured we shall find it, however previously hidden. It is only the ignorant who can overlook these connections, and yet in matters of the mind this oversight is esteemed the safeguard of truth!

I come now to the last division of my subject, Therapeutics. The other aspects of medicine might afford sufficiently pleasant contemplations, but *finis coronat opus*—care, and where possible medication, in order to cure. We are often twitted with being, as I have before said, merely passive attendants upon and worshippers of nature. As Goethe satirically says, “Man durchstudirt die gross und kleine Welt, um es am Ende gehen zulassen, wie's Gott gefällt.” This, however, I repudiate. We believe that God's will is that we should be wise and active and when we say, and I am sure our profession is not behind any in saying devoutly, “Thy will be done,” it is not that we may sit down, like fatalist Moslems, and let the supposed inevitable pass over us; but ours is an active interpretation of the prayer, that we may learn the Divine will in order to obey it, convinced that the Divine will is the exact contrary of ignorance. There is, no doubt, a time to each when he must bear his lot in patience and submission, but, as students and practitioners of medicine, our interpretation of the Divine prayer is in an active sense, and should incite us to every exertion. The will of God, as expressed in the purposes of the human intellect, is apt to be too lightly passed over, but he who has but a faint conception of that purpose will not be open to

Goethe's remark of letting events pass on without any effort to control them. It is only they who are weak in faith and intellect who exclaim, "The world (time) is out of joint. Oh, wretched spite, that ever I was born to set it right!"—for this is our true sphere of work. Whilst we more clearly discern the operation of those forces which bring health out of disease, we are not contented to be spectators only. Efforts of nature are regarded with watchfulness and doubt, and often must we agree with Professor Haughton, who, when told that the evacuations of cholera were due to an effort of nature to cure the disease, said, "I will tell you what Nature wants; she wants to put the man in his coffin. And that is what she succeeds in doing for the most part." In fact, the expression "effort of nature" is little else than a vague metaphysical conception, a mere *imago* of the true and practical *idea* of the recuperative forces which are at work in the organism, and which collectively we name the *vis medicatrix naturæ*—that centripetal tendency which restores the disturbed relations. Were we able to make a due analysis of this tendency in us, it would indicate a true science of therapeutics. It would show that in the subject of typhus or typhoid, or other fever, there were, together with the more obvious fever facts, others correlated to them, by which health is for the most part restored. In other words, that under the conditions of disease there lie physiological processes, which not only restore the normal equilibrium, but which leave a permanent resistance to any similar disturbance. The causes of this immunity are as much facts for our study as are those which we more commonly call the disease. For example, in smallpox, to the indifferent observer the whole disease is embraced in the description of its symptoms and the eruption; but there is a most important obverse to these in those prominent physiological changes by which the subject of them is likely to obtain a permanent indifference to the variolous process. I desire more expressly to say that, in the class of fevers, what we term the disease is but the attendant disturbance of an underlying process, which being completed, its accidents subside. We owe a very practical application of these views to Dr. Stokes, of Dublin. In some excellent papers on fever

he long ago pointed out that the various local affections in fever must be looked upon as part of the fever itself, and not as separated or separable conditions. I well remember the time when the irritation of the brain in fever was regarded as inflammation of the meninges, to be treated with mercurial inunction;—when irritation of the bowels and the foetid evacuations were to be corrected by giving the grey powder;—the obstruction of the air-passages to be medicated by blisters and expectorants. When I had to teach medicine, I impressed as far as I could upon the students of my class the importance in fever therapeutics of minding these local affections as our Nelson minded the signals given him to retire from action; whilst at the same time we maintain to the best of our power the strength of the patient.

In therapeutics as in pathology we have no kinship with those who believe that diseases are only sets of symptoms to be combated by drugs. The symptoms of a disease may, in fact, give doubtful and dangerous indications for treatment. The worst diseases have but few and not prominent symptoms, and even when the symptoms are characteristic they are not the disease. Frequently the most numerous symptoms occur without any disease at all. It may be all very well for the popular charlatan to make symptoms the whole object of his efforts, but to the better informed the chief fact is, as I have said, the condition which underlies and produces them.

In therapeutics the greater often depends upon the less. It has been said that Wellington overcame his great antagonist by attending to the shoes of his soldiers. This may have been so, for often we see great purposes frustrated by neglect of trifles: a man brought through his fever and dying of bed sore; a broken spine in process of repair, whilst death comes on from the careless passing of a catheter.

With the gold-headed cane and the horsehair wig passed away, we may hope, the days of pompous inanity; and we may further hope that nothing will hereafter be thought unworthy the attention of the physician which can contribute to the saving of a life.

For the surgeons, as I have hinted, a new prospect is

opening. Should advancing knowledge show that we have parts or organs of doubtful use, and especially if these equivocal parts are liable to disease, what a land of promise for operations!

But I must forbear. I am sure we have a hopeful future before us, whatever may be the direction of our efforts, and it is my duty and my privilege to invite you to enter upon it with industrious hands and true hearts.

ON THE STUDY OF MEDICINE.¹

MR. TREASURER AND GENTLEMEN,—I feel it a great privilege and honour to be in this place to-day. The occasion which brings us together recalls vividly to my mind the time when I first entered this theatre. Though many years have passed, I feel again, in sympathy with those whom I have now to address, the dread and doubt and fear as to the future which I felt so keenly then. Everything then seemed to combine to depress and bewilder me. Such a burden doubtless weighs upon the minds of many of you now here for the first time. It is natural that it should ; for, however full of hope and ardour you may be, the uncertainty and extent of the future cannot but cast some gloom upon the present. If it be so, it is my duty to bid you an encouraging and kindly welcome, and to give you, if I can, such directions as may aid you in making the journey of your life successful, whether cheered by prosperity, or chilled by disappointment and apparent failure. Happily, true success is not so much dependent upon accident as it seems. This truth you will confidently set before you foremost, not letting any circumstances deprive you of the assurance that what is most worthy the name of success is attainable under all conditions, and often the more certainly under those which seem the most adverse. That this is true, you must have already abundantly learned by the common testimony of history, and, what is better still, may learn it by the testimony of your own conscience. You will bear in mind that the claims of your manhood are supreme ; that, if you become successful doctors in the world's esteem, and fail of

¹ An address delivered at Guy's Hospital, October, 1874. Reprinted from the 'British Medical Journal,' vol. ii, 1874, p. 425.

becoming true men, your success will be but a cheat upon yourselves, and a stumbling-stone to others.

Though it would not become me on this occasion to touch too nearly upon personal and sacred subjects, still I would ask you to believe that honest work is a high and true service ; that availing yourselves of every means of moral and intellectual enlightenment is an imperious duty, and especially imperious upon you, who look forward to claim the confidence of society in its highest interests.

The study of medicine is liberal and unfettered. It ranges through human nature and into nature in general. It looks at man in every aspect, and has this great collateral advantage for its followers, that, in pursuing it, they are learning something of themselves. What this advantage may be to you as medical students is not to be calculated if it duly impress you with the fact that the laws of human health in its widest significance are part of the laws of moral and intellectual life ; that indulgence, sloth, and vice are as contrary to our lower nature as they are to the higher laws within us. It was, therefore, well said by Sir Thomas Browne, that "there are two books from which we may gather our divinity ; beside that written one of God, another by His servant Nature, that broad and universal manuscript which lies expanded to the eyes of all." I assert, therefore, that the medical student has peculiar advantages ; and that there is nothing in his studies to limit and contract his feelings or his sympathies, nothing to make him take a low and unworthy view of man or of his destiny ; but, on the contrary, as a learned divine whose name is dear to this hospital used to remark, he who is most occupied with disease and death will have the truest idea of life and of all that contributes to it.

Your studies require constant mental direction. As, in order to get a correct image from a mirror, it must be placed evenly before its object, so you must be careful that your minds are not obliquely set to your work, but freely and openly directed to it. It is a common error with young students to think that it is only by some strong intellectual effort that good work can be done ; whereas, in truth, it is more through patient and well-directed labour. You may,

in fact, often advantageously recall the fable of the hare and the tortoise ; for, in the study of medicine, you will soon be convinced that the race is not to the swift. If the first lesson be patience—a patience which knows how to work and wait, undismayed by what seems to be insuperable, such a patience as even Newton required and practised when he tells us that he learned to keep a subject before him, and to wait until by slow degrees light dawned upon it—the next lesson is docility, a readiness to learn at any source, not fastidiously or delicately, not where it may please us, but wherever the facts lie hid ; remembering that to the pure all things are pure ; and that, in the investigation of truth, there is no high nor low, no great nor small ; that, to use a common simile, like the rays of the sun, the rays of science enter alike every place. Who could have believed that the particles of a dewdrop and the masses of the planet are moulded and controlled by the same force ; that the introduction into the human body of a small particle of matter from a cow's udder might be the means of saving thousands of human lives ? We learn from these and innumerable similar instances that the highest truths lie hid in the simplest facts ; that, unlike human proclamations, nature's teachings are not by sound of trumpet, but often in the stillest voice, by indirect hints and obscure suggestions, but always with the unequalled advantage that they are unequivocal, constant, and uniform. The difficulty, however, is in maintaining the docile spirit of which I speak ; in preventing ourselves from assuming a knowledge we have not ; in not hastily coming to a conclusion without evidence ; and not resting content in our ignorance with the fool's satisfaction that no good would come of more knowledge if we had it. The student will consider what has already been accomplished by the industry of man ; what truths have been gathered on all sides ; how much has been done to make the world more habitable ; the victories over ignorance, disease, and pain ; and he will be stimulated to enter upon his work with enthusiastic earnestness, knowing that, great as these results are, they are but the firstfruits of a fuller harvest in which he may hope to take an active part.

The student's training of to-day must at every step be

directed by the light and checks of science, and his acquirements must go hand in hand with that high mental culture which can alone enable him to apply his knowledge successfully. If, in what has to be done mechanically, technical rules for action can be given, it is not so when living processes have to be dealt with; for then there has to be exercised the power of judging of the value of the known against the unknown, and of deciding for or against many obscure probabilities. These are difficulties we cannot avoid, and these are the difficulties you have to fit yourselves to meet. The voice of pure science would be for waiting for certain light; but suffering humanity has stronger claims, and cannot wait. Let me, therefore, insist upon the careful mental discipline to which you must accustom yourselves, if you are to use the knowledge you acquire with safety and advantage where failure is so easy.

The medical profession stands almost alone in having to make the investigation of nature its prime duty. Others may labour in the same direction from a pure love of truth, or to relieve the tedium of life; but the medical student, having once selected his part, cannot avoid the calls of duty to urge him to his work. He has to study always with the feeling that he must as far as possible fit himself for the position of trust to which he aspires. He has to acquaint himself with the course of nature, to the practical end of instituting a course of action under given circumstances. I admit that the study of medicine is throughout full of inducements to its earnest pursuit; but there is besides the further consideration that we voluntarily undertake the task of rendering material service to society, and are, therefore, bound in honour to do that service well. Were man's physical condition immoveably stable, were the equilibrium of his health constant from childhood to age, were there no accidents to cross his path, the proper study of mankind might still be man, but it would have no relation to the study of medicine. Whatever knowledge there would be of man so conditioned, it would have no object in practice. It might excite our wonder and admiration, but not our sympathy; for there would be no suffering, and no need of interference.

In the high object of medicine lies its greatest danger. The stimulus and the natural desire to act are mostly out of proportion to our knowledge and means for action. So often is it, as Goethe says, that—

“Was man nicht weiss, das eben brauchte man ;
Und was man weiss, kann man nicht brauchen.”

The motive to do something is but too apt to tempt to pretence of knowledge, which necessarily perverts the science and practice of medicine. How can I, therefore, so happily impress your minds with the dangers of charlatanism as still to leave your energies fresh to actively pursue the truth ; so urge upon you to neglect no means, to despise no service, which may be necessary to promote the successful operation of your knowledge, and yet guard you against ignorant and trifling interference, of which the least that can be said is that, if not injurious to the patient, it spoils the practitioner ?

The study of medicine, I have said, it is difficult to limit. The ancients called the human body the microcosm, and the outer world the macrocosm ; in fact, one world within another ; or, as the poet puts it, “Man is one world, and hath another to attend him.” There are infinite and intimate relations between the two, more and more intimate, perhaps, than we in our philosophy have yet dreamt of, though in our day we have gone far. You will, in the more discursive teachings of your subjects, probably be told that a continuous line of relations connects the macrocosm and the microcosm ; and you will at least learn that, if not continuous, the points of contact are too intimate and essential to admit of any distinct line of separation. The whole art of medicine is to know and to act upon these relations so as to favour what is favorable and exclude the contrary. The air we breathe, the water we drink, the food we eat, the mechanical accidents to which we are subject, and the varied operations on the senses, show how close these conditions are, and how immediately dependent life is in every way upon them—more dependent even than is commonly perceived, for it would seem that not only is our bodily structure formed and maintained by the surrounding con-

ditions, but even our mental state is thereby developed and its training advances.

The dogma that man's power and knowledge are limited by his observation of the course of nature cannot be too plainly impressed upon the mind of the student of medicine. It might well be written in letters of gold in every medical theatre. It is true, we may and must believe and hope far beyond the boundaries thus prescribed, but belief and hope are but pioneers and substitutes for knowledge, and where observation can lead the way there must be no halting in our steps to follow it. The first aphorism of the 'Novum Organon' sounds clearly the note in harmony with which our medical studies must be conducted, though I repeat that the limits of scientific knowledge are not the limits of hope and belief, even in the driest minds. They supplement and aid the powers of observation everywhere. The purest physicist works his way into the unknown by hope, and entertains a belief much more comprehensive than his knowledge.

The expression "order of nature" indicates a rule which, in one aspect, is the most hard and inflexible. Amongst all the ever-changing phenomena of Nature, in all her forms and moods, it asserts that there is an unvarying oneness beneath. The harmonies may be infinitely varied, but the vibrating chord is unchangeable. Realise, if you can, what a paralysing influence on all scientific inquiry the ancient belief must have had which attributed the operations of nature to the caprice not of one divinity only, but of many. There still remain vestiges of this in most of our minds, and the more distinct in proportion to our weakness and ignorance. It still opposes a hindrance to knowledge, and resists the conclusions of experience. In fact, few really believe in a fixed course of nature; none, indeed, but they who have undergone much mental discipline.

I say that, in one aspect, the course of nature is unvaried. The materials, the material atoms, as we now think of them, the physical elements, as they are called, are believed to have constant qualities. What these qualities are we only know very imperfectly, but, as far as our acquaintance with them goes, they are not subject to any variation.

The variations in phenomena are the variations in their combinations or the variations of their relations ; but in the substratum itself there is no variation, nor any in the resultant where the conditions are the same. That is the law of nature, but obviously its course admits of infinite variations. What are the changes that can be rung on twelve bells, used to tax our boyish calculations ; but what are the resultants when twelve elements combine in infinitely changing proportions, who can express ? Yet still this is but a part of the problem of the play of the physical atoms, which, far from being dead things, are centres of active powers expressing themselves in various ways, of which we know at present only some, under the forms of motion, heat, electricity, and magnetism.

That the course of nature may be varied we have assumed by our meeting here to-day. The whole object of the science of medicine is based on this assumption. It is the whole purpose of our knowledge to find out and obviate what is inimical to our systems, and to discover and promote what is favorable to us. It is difficult to form even an imperfect image of the course of nature in a living thing. What we call health, which looks so fixed and stable, is more changeable than the stability of the rainbow. Its maintenance depends upon the moving equilibrium of more forces than the mind of man can realise. The inorganic elements make a constant war upon us, and yet maintain us by the strife. Everywhere this struggle for existence has to be maintained ; but in man, for the first time, intellect comes to take part in the struggle. It is the curious work of physiology to trace from the first shrinking of the lowest organisms, through all the gradations of instinct, this power which becomes intelligence in man, with the prerogative of knowing the course of nature, and of changing it for his good. When we hear the complaints of the weak and ignorant against the hardness of their lot, when we are moved in sympathy with the sufferings of the sick, let such complaints and our sympathy remind us that in the providence of God the intellect of man comes in as a corrective agent.

It is both impious and foolish to stand with our backs to

the storm bewailing our miserable plight, or to remain patient under it through the deadening influence of superstition, like brute creatures on a waste moorland. Even at present, feebly instructed as we are, so much has been done as to give us good assurance that the time will come when the triumph of the intellect will fully "justify the ways of God to man," not only by obviating or controlling human suffering, but by so combating the faults of ignorance, and enlarging knowledge, that humanity may recognise its high destiny, and walk in the light of it. Bacon justly says, "*Vere rem reputanti philosophia naturalis post verbum Dei certissima superstitionis medicina est eademque probatissimum fidei alimentum.*" We have disarmed the lightning of its destructive force, and tamed it to carry our thoughts across the world, affording an instance of what was once regarded as evil turned to good in relation to that order which man's life requires. Again, let me instance the pestilence (typhus fever), whose ravages were so mysterious that the inspired writers speak of it as one of God's sore judgments walking in darkness, and humbly consider what power the intelligence of man has gained over it. We have tracked it to its lair, have discovered its cause and their preventives. Dreadful as have been its visitations, we have learned so much of it as to see that its teachings are friendly. I am not speaking the language of metaphor. The pestilence which formerly swept over the world like a scorching wind, withering and destroying the human race in uncounted numbers, had no mysterious or supernatural origin, but was the natural product of want and squalor—a protest against the violence, selfishness, and ignorance of man. The friendly relations of commerce and the common uses of cleanliness have as entirely disarmed the pestilence of its terror as the lightning conductor has diverted the bolt from its threatened victim. Happily, these are not solitary illustrations of man's power to modify the course of nature for his own good. Civilised life is but a varied expression of such illustrations. There still remains an unlimited arena for future work, and for that crusade against the powers of evil which is inaugurated in this and in other hospitals year after year.

As respects nature's unswerving order under like conditions, you have not only to realise it for yourselves, but at times you will have to impress it on your patients and on the public. I said just now that few persons had a uniform belief in this stern course of things. All would perhaps assert that they have, but we see too plainly both the individual and the public health suffer in many ways through the operation of the contrary feeling. The laws of health are broken on all sides with the lurking confidence that there is no attendant Nemesis to vindicate their observance; whilst at the same time the worst things are submitted to because they are regarded as natural and therefore inevitable. Nature, to the student of medicine, is not a name of terror or superstition. With all its stupendous forces, it still conveys to his mind the idea of rightness and beneficence. As he traces the progress of living things from the dawn of time to the present, he cannot but recognise an evolution to an ever higher perfection. Fixed as is the course of nature, it does not seem to him fixed by blind necessity, but ordered so that the intellect of man may learn it and dispose it for his good. As yet we live but in the infancy of science, and who can say how much our present state is limited by our ignorance? That cannot be known until Science shall reach her own limit, and has to confess that nature will reveal no more.

To come to that which will most have to occupy your time here, the course of nature in disease. You will soon learn that diseases, like other natural facts, require no peculiar mode of study. Without doubt, the personal interest we have in them does much to hinder their due investigation, and surround them with a mysteriousness which is not essentially belonging to them. Man is naturally unwilling to feel himself but a part, though the highest part as yet, of the course of nature, however deeply he may be convinced that all is ruled by the wisest providence. He desires to feel himself an exception from the common laws of nature. There is essentially the principle of fear in all living things. Its physical expression is that shrinking of of a piece of living jelly when it is touched, of which I have spoken, or the closing of the eye to a particle of dust,

and all the like phenomena. The fear of change is essential to the safety and growth of a living thing, surrounded as it is by causes which are calculated to invade and destroy it. It is the groundwork of that struggle for existence through which all living things have advanced, and is in another form the chief spur to the human intellect. We cannot, therefore, be surprised to find this feeling, in one way or another too intrusive, thrusting itself between the facts and their due observation, and surrounding them with a sort of personal and exceptional mystery. It was the great merit of Hippocrates to have striven to break down this barrier of mysteriousness which prevented medical progress. But though so many ages have passed, all traces of it are not gone. The sense of mystery is so indigenous, and so constantly attaches itself to the unknown, that, although I do not for a moment suppose any well-educated medical man could think that disease ever comes but through discoverable natural courses, we assume almost as much when we are satisfied not to have traced them to their beginnings. It is curious also to notice how our language still retains the terms expressive of the mysterious origin and nature of disease. The epileptic is still said to have "his seizure," though we have long known that the cause of the convulsion is but an irregular oscillation of nerve-particles transmitted to a given point. The apoplectic state is still commonly called "a stroke," though anatomy has shown it to be traceable to anything but mysterious changes in the blood-vessels. Diseases are but parts of a course of natural history, some as simple as the growth of a lichen on the surface of a rock; others dependent upon the development of some lower creature in us, "fellow-lodgers," as they have been called; some no more than irregular oscillations of nerve-tissue, as I have just said; others, the so-called inflammations, are but deeper lesions of the nutritive functions; and so forth, in every variety, according to the course of health in us, and the course of nature surrounding us, but always, as you will perceive, as parts of a natural history. Medicine has much advanced since she has freed herself from the old conception of diseases being independent entities, admitting of classification and of being labelled in orders and sub-orders. We are, how-

ever, not yet quite free of this, nor can we, in the nature of the case, altogether avoid definitions, though the aim of a good medical education is to teach you to use words and definitions but as a medium for arranging knowledge, not for restricting it within artificial limits, and crystallising it as it were into uniformity.

Plain as is the course of study before you ; simple as are the means for its proper pursuit in a due training of the senses and the intellect ; unembarrassed as you may feel yourselves with any supposed necessary prejudices or weight of authorities ; encouraged with the assurance that the prerogative of genius, where it exists, is only more exact and continuous labour ; and certain that success in the prosecution of medicine as of other natural sciences must really be dependent upon the knowledge acquired, I should mislead you did you suppose that your task was an easy one.

If it required the genius of Bunyan to outline the way of the "Pilgrim's Progress" for his moral journey, and to describe all the hindrances which would beset him from men and things through the Slough of Despond and through Vanity Fair, it will require all the genius of your teachers to direct you in the intellectual journey which you commence to-day. But I may say this much, that the course of the two journeys is parallel, and, if well pursued, they end in one goal, your temporal and eternal happiness.

I have spoken much of intellectual culture as if it were the main purpose of your medical studies, and though it is certain they cannot be rightly pursued on any lower ground, still I should remind you that there are other calls for your energies. Whatever duty you owe yourselves, there is further that also which arises, as I have before said, from the claims to be hereafter made on your knowledge. The public have a right to expect that you shall lose no opportunity of preparing yourselves for that trust which must be confided to you in practice. If, therefore, there be any among you to whom the love of knowledge, the pleasures of its attainment, and the incalculable personal advantages it bestows upon its possessors, are not motives sufficiently strong, or operate but feebly, let them remember that they are at least bound by the obligation of service and reward.

Most of you, and probably all of you, look for success in future practice. There should be a double success; your practice should be as successful to your patients as to yourselves. This is what may be fairly looked for. I do not mean that your patients can measure successful practice by recovery from disease, or should expect you to do impossibilities, but I mean that the sick man has a fair right to expect and to receive all the aid that is possible under the circumstances, if you, on your part, look for substantial reward. Whilst I speak thus I feel I owe it to the members of my profession to assert that mercenary considerations have had but little influence with them. No set of men are more unsparing of themselves or more open-handed in their services for public or private good. I could, did it not seem invidious, say they are unrivalled in this respect. You will therefore, gentlemen, for the sake of your profession as well as for yourselves, maintain the position I now assert. Accumulate all the high and honest motives you can for your intellectual advancement. They will severally be wanted on different occasions, whether they be such as arise from duty to your friends who send you here, and the arguments of love and honour they include, whether from what is due to yourselves as having intellects to instruct and knowledge to acquire, whether from the high reputation of this school, which, as students of Guy's, you are bound to maintain, from the demands of your profession, which justly expects that you will fit yourselves to ornament its ranks and advance its influence, or from society, which will reward and honour you if you do it service. Supplement these reasons by the highest, your duty to the Highest, Who alone can satisfy the wants of your nature, and with Whom a faithful study of your profession cannot but make you better acquainted.

In the strongest of your doubts and mistrust of things you must faithfully look beyond the clouds that oppress you, and fix your minds upon the certain truth that, however halting and tortuous, the course of nature in man tends to physical, moral, and intellectual perfection. No disappointments, no failures, how often so ever repeated, should make us turn our backs on the final purposes of our life. It has

been thought that the study of medicine has been apt to divert the mind from these higher considerations. I believe such an opinion to be as unfounded as that our familiarity with suffering makes us indifferent to it. Such opinions are held only by those who are either ignorant of the large extent of our studies, or who do not sufficiently bear in mind that its range is from the "atoms that make the textures, to the hopes that make the man." As students of man, we can no more ignore the immeasurable relations of the one than we can deny the ponderable relations of the other, for man's hopes as rightly tend to the highest and the best, as his material atoms to the centre of gravitation.

There is a necessary caution arising out of an expression I have made use of. Medicine, I assert, is unfettered in its lines of study, and, as man is its subject, this implies that whatever concerns his bodily or mental existence is open to our research freely and without prejudice. This is a position which medical science, as one of the natural sciences, must occupy. But we may not jump to the conclusion that scientific progress is so far advanced that a complete and satisfactory theory of man can at present be given. It is said that the medical profession is especially open to such hasty conclusions; that, being so largely occupied as we are with the more fleeting phenomena of existence, and seeing more of the weakness than of the strength of man, we are naturally led to ignore his higher nature and to regard him but as a very exquisite piece of material mechanism and no more. No doubt there is this danger—whatever part of a subject most presses upon the attention is likely to occupy it too much, and to exclude that larger part which must be taken into consideration for a proper conception of the whole. But this may be corrected by reflection. The medical student, when he has learned all that is known of oxygen, hydrogen, nitrogen, and carbon, and the other chief organic elements which play so great a part in our existence, will ask himself how much still remains to be known about them. When he enjoys the fragrance of a rose, he will, perhaps, reflect on all the conditions of it, and he will find he comes to a chasm he cannot leap. At present we know only in part. The mind is not advanced

as yet so far as to know either all its weakness or all its strength.

The teachings of science are, doubtless, full of hope and belief. It is only when we think its work is so far done that we can see the end of it that disappointment comes in, and with it a conflict between our instincts and the supposed reality. Hope and belief are the necessary supplements of imperfect knowledge. Without them, we should deprive ourselves of the best motives and surest grounds of action.

I have thus far tried to indicate, though very imperfectly, the character and scope of your work and the temper of the intellect in which it must be conducted, and now I must add a few words on the method of it. The order is, more or less, fixed by the several examining bodies to which you have hereafter to present yourselves, but understand that the method must be your own.

First of all, resolutely determine that you will never be satisfied with second-hand knowledge from lectures or books, where it is within your power to get impressions directly from the objects themselves. The necessity of this is the ground of your having to come to a medical school. Anatomy, chemistry, practical physiology, morbid anatomy, and clinical medicine are not studies of which you can acquire any proper knowledge through books or descriptive lectures. The things must be seen, handled, analysed, and dissected by yourselves. They require of you a personal and intimate acquaintance to be of any practical good. Words and descriptions, good as they are, after you have acquainted yourselves with the things themselves, are always ready to come between you and the objects and to dim your impressions of them. Many a man, most of us indeed, goes through the world without ever coming into scientific contact with the things in it. We look through the eyes of others. Our impressions and thoughts are mostly but shadows of shadows; no wonder, therefore, they are so inconstant and confused. Why, I might ask in all simplicity, have you eyes, if they are not to be trained for the purposes of your profession? Why touch, if not to be used in detecting injury or disease? The senses and the mind are active powers which call for due objective

exercise. Medical study is a mere pretence without it. You do not come here as passive receptacles to be filled through books and lectures with a complement of so-called knowledge which shall fit you to answer questions. Happily the times for this are changed. Examinations themselves are passing from the verbal to the objective stage, and nothing can supply the student with so practical a stimulus in the right direction as this change. I will not say anything to lessen the value of lectures. In some points, lectures are indispensable. Many of them are demonstrations of facts, where you are shown at the same time the method of inquiry and the results of it. In a lecture you have also the teaching by personal influence, which is invaluable. Example is contagious, and descends from teacher to pupil. This accounts for those fertile spots in literature and science which spring up from time to time. This it is which gives a character to a school.

As to books, for the most part read the most recent on the subjects you have to study. Knowledge in every department is growing fast. A book on physiology or practice of medicine soon becomes obsolete, or ought to be so. Hospital reports, journals, and year-books are, for a profession like medicine, invaluable. Their flourishing existence is a sign of activity and progress ; they store up our gains and afford the soundest materials in the literature of our profession—a source from which the best treatises on a subject are produced. Nor must I forget your weekly ‘Hospital Gazette.’ It is very useful auxiliary in your work, as well as a means of friendly interchange of ideas between you. I hope it will be kept up with vigour.

Though most of you must hereafter be chiefly occupied in practice, all will have opportunities of adding something to the stock of professional knowledge ; whilst some, we may hope, may make such larger contributions as shall add fresh honour to our school. It was in our medical theatre that Jenner read his first papers on vaccination. It was in our wards that Bright pursued his investigations, which have made his name so famous. It was in this theatre that Addison instructed many generations of Guy’s students, and, through his clinical and pathological researches, left an

immortal name. Nor must I forget Sir Astley Cooper, who laboured so much in the foundation of our school. May the example of such men, whose memories are so dear to us Guy's men, beget in you a lasting enthusiasm for your profession.

As the method of your studies is objective, it requires no arguments to prove what advantages may be gained by the use of those instruments which aid the sense; the microscope, the thermometer, and the sphygmograph. You will naturally avail yourselves of these and of all such other means as may further exact observation; at the same time, do not fail to educate the unaided senses. Their educational susceptibility it would be difficult to limit. See all you can by the unassisted eye or the common lens, and educate the touch to its finest development. Where exact means are available and applicable, you will obviously have recourse to them. In the study of your profession they are indispensable, but in practice we are often prevented from their use, and have to reply upon mere technical skill.

You will not study your profession in a narrow or niggard spirit. Though the centre of all your work lies in man, you must gather up your knowledge from a very wide radius if you are to understand the problems he presents. At first view, there is an apparent independence and unity in a living thing which sharply separates it from its surroundings; and of all living things, this appears most in man. Our idea of an individual commonly limits itself to the anatomical outline; but physiology teaches that no proper outline can be drawn. What meaning would muscles have without gravitation, which itself is dependent upon the size of the earth we inhabit? Draw a close line of separation between man and the surrounding air, and where is his life? What would be the scope of our knowledge without light? What constitutes the body itself but a constant relation to freshly added materials? The human body does indeed especially express the idea of unity, and its oneness is such that we may say of it as Newton said of the physical universe, "*Centrum ubique, circumferentia nusquam*;" but physiological studies soon show the human unit in far wider relations than those which are simply corporeal. Man

is both more and less individual than he seems at first glance ; more in the direction of that close relation and dependence of our organs one on another which forbids a partitioning them into separate sections for the special purposes of medical practice, and less in the direction of our surroundings and antecedents. This conviction it was which led Hunter into the field of comparative anatomy, with what honour to our profession you all know ; and the same conviction must actuate you to obtain a fair knowledge of biological science, which, if it do not confer power on you as medical practitioners, will at least throw such a light on your work as will enable you to do it better.

You and your friends will perhaps say that the time here for acquiring a comprehensive, together with an exact acquaintance with your subjects, is too limited ; that you do not come to the hospitals to be chemists and biologists, but practitioners. This I admit to the full ; but at the same time, from the nature of the subjects themselves, and in the presence of that wider individuality of which I have spoken, and which often connects the farthest fact with the nearest detail, it must be maintained that to know one thing well you must know its relations to many others. This truth in respect to the study of man is the chiefest. Most of our errors respecting him, whether in regard to his bodily or his mental organisation, have arisen from experience gathered in too narrow a circle and therefore fallacious. As to time, the shorter it is, the more important that the method of study should be intelligently arranged. Acquaintance with known facts, if undertaken practically and under good direction, though slow at the outset, is in the end a saving of time, because the results on the mind are more lasting and fruitful. If medical education had for its end only mechanical operations, I grant it would not require more than a technical acquaintance with details ; but neither medicine nor surgery is a mechanical art, though the uninitiated public regard them so. So they regard the body as a piece of very good carpentry and joinery, and think any one of its organs, like the wheel or piston of an engine, can be mended by medicine duly prescribed. Such ignorance is easily satisfied. It is not for its satisfaction that

medical studies are required at all. It very rarely occurs in the practice of medicine and surgery that merely mechanical performance can fully meet the conditions of a case. When it can, the man who does the mere mechanical operation most often will be likely to do it the best. Nor should this excellence be depreciated; but when the treatment of disease ceases to be mechanical, we require for its proper direction a very different mental cultivation. It is the admission of this which is advancing the study of medicine, and from which we may with full assurance augur a greater future.

With all the extension of knowledge, the student of modern medicine has a far more advantageous position than his predecessors; the facts you have to learn are better known; the relations of your subjects have become more fully illustrated by collateral knowledge; the limit of our ignorance is more defined; the general public are better instructed, and therefore more able to appreciate sound knowledge; authority and so-called experience, the "wig and cane," are less imposing, and the well informed, though young student, begins his career of practice under favorable auspices. There is something of the spirit abroad which one of our American cousins expressed when walking through St. Paul's Churchyard he read over a shop 'Established 1726;' "That would not do in my country; it would be better if it started yesterday." In proof of the vitality of our profession, and how little it is dependent upon the supposed prescriptive rights of age, I might point to the clinical labours of many of our younger members, who are daily making most important additions to practical knowledge.

To repeat, the end of medical studies is not to satisfy the ignorant, but to satisfy the requirements of science. I am conscious how unequal we are to this, but we need not be unequal to the duty it imposes. With all care you will find it difficult to keep the mind even to its duties under the disturbing influences which are necessarily associated with human suffering. He does well

"Who, when he is to treat
With sick folk, women, those whom passions sway,
Allows for that, and keeps his constant way."

If I am oppressed with the feeling of having but too imperfectly indicated the spirit in which you should enter upon your medical studies, I satisfy myself with the reflection that you will be more effectually aided and directed by your teachers in the several departments. I know, from long and intimate acquaintance with most of them, that they will not fail to impress upon you the importance of applying yourselves to your work in a scientific spirit. They will insist upon the fact, that you can fit yourselves for the practice of your profession only by sound intellectual training, as well as by an accurate knowledge of details ; they will caution you against substituting words for things ; they will tell you that the most important part of your work is of a humble kind, consisting of an acquaintance with the proximate conditions of life, and not with the unfathomed and perhaps unfathomable metaphysics of it. Their object will be so to instruct you that, whilst you are not deficient in any part of that knowledge which is open to you as medical practitioners, you will still be aware of your ignorance, or what should restrain you from futile attempts, and from becoming believers in some fanciful theory or other springing out of too limited observation. The chemist will descant on the nature of atoms, and exhibit to you many of their properties ; but he will have to point out, as I have already said, how much we have to assume respecting them, and that they are still very mysterious essences. The anatomist's task will be the most satisfactory because our knowledge on that subject is the most complete, and, as our colleague Mr. Hilton has abundantly proved, admits of some *rationale*. The physiologist has a harder and drier duty in pointing the development of the organs and the combination of their functions into an organic whole, since if he lapse—as who can at all times help it?—into theories of the “Why,” he weakens the directness of observation upon which you must build, if you build securely. Then comes the pathologist on the nature and course of disease, proving it to be mostly but a part of physiology. After these, therapeutics, happily much less encumbered than formerly with a farrago of nostrums, since pathology has taught us that the processes of disease have often a conservative tendency, and that frequently our duty is to do no

more than prevent violent interference. When and how we can do more, it is the great objects of therapeutics to point out. Of the study of the practice of medicine and surgery, everything around you here speaks at all times and invites your attention. The several departments of the hospital afford the rarest opportunities for acquaintance with accidents and disease in all forms; and if a knowledge of the practical parts of your profession cannot be gained here, it may be certainly said it cannot be gained elsewhere.

I look back with pleasure to the time when I had no world but the wards of this hospital, and often regret I am now so separated from them. All the success I have had springs from Guy's, and here are my early and best associations. I cannot, therefore, but feel as one of yourselves. I could wish it were again my lot to work with you, but the time is passed, and younger and stronger hands will direct you, whilst it only remains for me to cordially wish you success.

Mr. Treasurer, I cannot close this address without publicly acknowledging the great debt which our hospital and school owe to your able and devoted services. I know that you and the governors are deeply convinced that the prosperity of the two are intimately connected. My colleagues equally feel this to be so, and speaking for them, I may confidently assure you that their best energies will be devoted to both.

ADDRESS AS PRESIDENT OF THE SECTION OF MEDICINE

AT THE

INTERNATIONAL MEDICAL CONGRESS, LONDON,
AUGUST 3RD, 1881.

GENTLEMEN, FRIENDS, AND COLLEAGUES,—I am deeply sensible of the honour conferred upon me in being called upon to preside over this Section, and I offer you my cordial thanks.

Happily the duties will not be arduous, since the general addresses which have been arranged and admirably allotted, relieve me of the responsibility of attempting to develop before you the actual position of medicine, or the probable lines of its future progress.

As the International Medical Congress assembles in England for the first time under the auspices of Queen Victoria, so I am reminded that 300 years ago, under Queen Elizabeth, Bacon enunciated for the first time, in the simplest terms, the position of the student of nature in relation to the work before him.

Prone as we mostly are to easy satisfaction on imperfect evidence, and to rest in the *experientia fallax*, it is something that we are all agreed, in aim and means, and admit that there is but one source and test of knowledge, "the obser-

vation of the order of nature." We have no principles, but facts ; no eclecticism, but of these ; and nothing touching the conditions of humanity is foreign to our consideration.

Anatomy, physiology, and pathology have an impersonal and scientific object. Their aim is wide and general. The facts with which they deal are subject to no deflection from affection. Great or small, they have all an equal value. Pathology even denies its name in the presence of that which is universal, merges into physiology, and sees that "whatever is, is right." But far otherwise is it with clinical medicine, where the welfare of the individual alone has to be considered. We call ourselves physicians, and cannot be too jealous of the title and of all that it includes ; but we are *Medici* or curers of disease. Hence, together with the highest duties which science imposes, there are the various personal claims of humanity, augmented by suffering and charged with every disturbing element that weighs upon the heart of man ; but at the same time for us with every high and quickening motive. These are warping influences, and to correct them we have often with effort to bring our clinical questions into relation with that which is impersonal and above passion.

It is an agreeable fancy on these occasions to suppose that civilisation may have been differentiated into its various nationalities, less for the strife of war than that each nation might contribute, according to its genius, to the progress of the sciences. It may be Utopian to see it thus. Yet a review of the past two or three centuries would suggest as much. That scientific congresses have met, and they continue to meet, promise better things to come out of the social chaos—as the imagination realises organisation springing up amidst the strife of the elements in an early world.

To Italy and the South we owe the early development of anatomy. The illustrious names of Morgagni, Galvani, Scarpa and others, many of whom have left their names for ever inscribed on our textures, bear early and continued witness of this. And although we Englishmen will ever be tenacious of vindicating for our Harvey the immortal honour of having first demonstrated the circulation of the blood, we equally admit that Italy was his teacher of anatomy. And no less did Italy lead the way in morbid anatomy, as testify

the pages of Morgagni in his treatise 'De Causis et Sedibus Morborum.'

To Germany and the North we are largely indebted for analytical progress. Their profound investigations in chemistry, and their exhaustive researches into minute anatomy and histology, have gone far to solve the problems of organic composition and organic structure. I will not support my position by citing illustrious names. Happily, many whom I should have to mention are still amongst us; but biological science will never forget Leauwenhoek and Ehrenberg, or Berzelius and Liebig, nor the labours of the modern schools.

France, with her rare synthetic faculty, seems specially gifted for promoting the science of physiology. I have but to recall the name of Bichat, and to point to the refined investigations of Bernard and to those of his successors of to-day. And with France I may join Switzerland, whose Haller gave the earliest and strongest impulse to the study of the laws of living things as a separate science; though, as in the case of Harvey, his lamp was lighted abroad,—in the famous school of Leyden.

The English genius is perhaps more fitted for the Historical method, and its obvious lessons. But perhaps I ought not to say obvious, for not rarely the English have been satisfied with records without inferences. There are, however, splendid instances of both; of the one in the museum of Hunter, and of the other in the works of Darwin.

But here you will be ready to exclaim "Siste!" for who in the least acquainted with the progress of the biological sciences in different schools at the present time, would venture to claim for either some special fitness over the rest for any line of pursuit, and when the spirit of each can say like Goethe's *Natur-geist*—

"In Lebensfluthen, im Thatensturm
Wall ich auf und ab
Wehe hin und her!"

Some have prophesied that the advancement of the biological sciences will leave medicine a barren waste in their midst; but such a result, in the natural course of

things, cannot happen. There is an indissoluble union between all the sciences which, for medicine especially, human interest will ever strengthen. The past history, and the present state of our profession, give us abundant assurance of this. It is not too much to assert that the study of medicine will for all time attract a large proportion of the best thinkers and workers of the world. It has ever been so; and what has been, doubtless shall be in the time to come. Besides, almost every germ of scientific thought has sprung in some way from medicine; and I have only to remind you that some of the most illustrious physiologists and pathologists of to-day are members of our own profession. And if from the delicacy, intricacy, and the demands made upon all the powers of the intellect by the extent and character of their investigations, they have as it were turned aside from immediate clinical work, they are still so much in union with us that we daily at the bedside avail ourselves of the results of their labours, and gratefully acknowledge that they are our ministering angels, ascending and descending upon the ladder of science in the furtherance of all good practice.

Clinical medicine, however, of itself, affords opportunities for the study of pathology which are, in some respects at least, unique. Through it, and through it alone, we become acquainted with the first deviations from normal function. From such early beginnings we may trace the development of pathological processes, until the organism is finally, and in different ways, overwhelmed by them. I need only suggest those chronic lesions which spring up from conditions *ab intra*. In the later stages of these degenerative processes, we are apt, without their history, to be so impressed with the more prominent mechanical results, that these would seem to us the original and essential conditions; as, to the Nile-worshipper, the River is a power in itself.

It is well for the progress of clinical medicine that its lines of investigation are thus intimately interwoven with the more scientific departments. It saves us from the dangers of Separatism, and our colleagues from those of Pharisaism; and it quickens our observations where they might otherwise be thought insignificant. If we cannot

weigh and measure the data before us, we may still advance the solution of some of the more difficult problems of our condition by critical and exact records. How much has been done in this field of late, especially in cerebral physiology, need not now be told. Every fact to the clinical physician has its value, though it may be of a different order to the phenomena of gravitation. A tone of the voice, the play of the features, the outline and carriage of the body, are to him as invariably related to the central conditions which they reveal, as are the grosser facts of nature.

The work of the next few days, so far as it is foreshadowed by the list of promised papers, will raise some important pathological questions. You will be asked to consider peripheral lesions, having their origin in nerve-centres—lesions which have for the most part been hitherto chiefly considered primarily humoral and chemical, but now referred to “trophic changes of nerve-origin.” On this point it may be not uninteresting to notice how “*Solidism*” is widely re-asserting itself in the science of living things; not as an *à priori* system, but through the progress of knowledge. The proximate conditions of pyrexia are no longer vaguely referred to nerve, but to definite nerve-centres; hyperæmia and inflammatory changes to sympathetic lesions; abnormal chemistry to the great respiratory centres; the strange conditions of Addison’s disease, with its characteristic pigment, to the supra-renal bodies, themselves probably but nerve-centres, and related, at least by structure, to the system of the pituitary gland; epilepsy, supposed in Hippocratic times to be due to extraneous maleficent spiritual influences, is traceable to apparently trifling changes in a few grey nerve-cells. The specific fever processes notoriously owe much of their character and intensity to the nervous system. Their relation to time, their occurrence only in warm-blooded animals, the great mortality they cause through nerve-exhaustion, and the immunity they leave behind them, indicate that whatever may be the nature or mode of operation of their several poisons, it is by implication of nerve-elements that fever obtains its chief clinical characteristics.

Further, in the advance of "Solidism," what can interest us more than the recent investigations on Contagia? Perhaps no more important step has been made in practical pathology than the proof that some at least of these contagia are organised solids. This discovery, which it has tried the patience, experimental skill, and scientific criticism of the best observers to establish, has brought us at length within view of that which has hitherto been so mysterious. To have been able to separate, though imperfectly, the contagious particles; to have come to the conclusion that no fever-poisons are soluble—is a hopeful preliminary towards forcing them to yield up the secret of their nature.

If "Solidism" as a theory of organic processes wanted confirmation, we could point to nothing more striking than the present established views on putrefactive changes; and to the amazing fact that the normal textures and fluids of the body resist decomposition unless invaded by microscopic organisms.

May we not hereafter find that all organic chemistry is the resultant of mechanical changes in organic solids?—all nature, in fact, as Newton asserted mechanical, but the Great First Cause? Of this we are admonished on all sides. Histology, physiology, pathology, clinical medicine, teach us more and more the supreme importance of *form* and *relation*.

Lesions extending from alteration of the blood-vessels will also come under consideration. Of course the more common facts relating to aneurism and valvular disease, or such as are thrombotic or embolic, need not be discussed; but there is a contribution which raises the question how far primary general arterial tension may be a starting-point at least in renal pathology.

The ætiology of typhoid fever will be raised at one of our meetings. This cannot but enforce a rigid criticism of the infective processes, and of the differences between the states of simple pyrexia, septicæmia, and the specific fevers.

The pathology and treatment of gout, rheumatoid arthritis, and rheumatism, to which, in one form or another, the English seem rather especially prone, will also come up for discussion. Whether they have humoral sources has of late become more and more doubtful.

Of the pathology of acute rheumatism we may be said to know but little beyond its clinical records and its symptoms; but unhappily this has not always been sufficiently recognised, and too often a dangerous poly-pharmacy has rushed in to the cure where science has not yet advanced her foot.

The forms of renal diseases, for a long time included, with little exception, under the term "Bright's disease," will undergo a further degree of analysis. It was a happy omen of this when they moved from the singular into the plural form, "Bright's diseases;" and we may hope now for a more methodical subdivision of them, making their clinical recognition more easy, and their therapeutics more precise.

In the matter of diagnosis we have invited contributions on the pathognomonic and diagnostic value of the localisation of disease in the brain and spinal cord, which will be an occasion for a review of our knowledge of *cerebral* and *spinal mechanism*, and for further elucidating the pathology of the different conditions of blood, blood-vessels, and connective tissue concerned in the nutrition and diseases of these great nerve-centres. Brain-texture proper seems but little liable to primary disease. As the nervous lamina takes the lead in embryonic evolution, so it would seem that its equivalent in the adult maintains a degree of resistance to morbid change throughout life.

Time fails me to speak of all that we hope to undertake. Any one paragraph of our programme would more than consume the time at our disposal. It must not therefore be inferred that the importance attached to any one of the subjects is in proportion to the prominence given to it in this hasty review. The treatment of disease, for instance, is a subject too large and weighty to speak of in general terms. In some minor points it will come before us, as in a paper on the advantage of high altitudes in the treatment of pulmonary phthisis.

An organisation such as our own, which it has taken countless ages to evolve, must reasonably require incalculable time for its scientific analysis; and the same may be said of the infinite and varying conditions by which it is

maintained, and upon which its existence constantly and immediately depends. At best we know but a few proximate facts, yet these in judicious hands have afforded a good harvest of practical results: what better fruit we may gather when science has penetrated deeper into the laws of our being, and all that affects it, it is impossible to forecast.

In the spirit of the exhortation given by the President in his address to-day, and in the slightly altered words of Bacon, with whom I began, let me conclude by saying, "It were a heaven upon earth to have the mind illumined by Knowledge, to move in Charity, and turn upon the poles of Truth."

THE COLLECTIVE INVESTIGATION OF DISEASE.¹

MR. PRESIDENT AND GENTLEMEN,—When invited by your President and the Council of the Metropolitan Branch of the British Medical Association to address this meeting on the Collective Investigation of Disease, I gladly accepted the honour of the invitation, since the whole sympathies of my life are in the direction of this movement.

After the admirable addresses made in different parts of the country on this subject, first at Chester by the late Dr. Hughes Bennett, Dr. Waters, and Dr. Ransome, then at Cambridge by Professor Humphry and Dr. Mahomed, and lately at Birmingham by Dr. Foster, Mr. Macnamara, Professor Haycraft and others, though I cannot hope to present this matter in any new aspect, or to add anything to the arguments in favour of it, still I am glad of an opportunity, in conjunction with Sir James Paget and others on this occasion, to take part in promoting what promises to be of so much advantage both to the public and the profession.

This meeting may be considered as a supplement, though it is but accidentally so, to the Bradshawe Lecture, given a month ago at the Royal College of Surgeons by Sir James Paget, in which he endeavoured to draw the mind of the profession into new lines of pathological inquiry, and to

¹ An Address delivered before the Metropolitan Counties Branch of the British Medical Association.

consolidate the results by the formation and extension of museums of morbid anatomy.

Now, although morbid anatomy is at an immeasurable distance from a great part of medical pathology, as physiology is a distinct science from anatomy, still both are built on anatomy. Without morbid anatomy our work would be foundationless and in the air. Nevertheless, my object to-night is to direct your attention to, and to enlist your services in the investigation of a region of facts, which in large part at least lies at a far distance from the gross mechanical terminations of disease as they come before us in the *post-mortem* room. And although the hoped-for gains of this collective investigation movement may not be such as to admit of being labelled and placed on the shelves of a museum, they will serve to throw a new light on what is already placed there, and will at least help us to a better knowledge and practice of our profession.

You will admit that a migraine headache; an attack of asthma from the smell or sight of some particular object; the troubles of digestion from mental work and anxiety; the special liabilities to disease of certain families, and the cloud of small ailments which often make life intolerable, though having no morbid anatomy, deserve a more exact study than they have yet obtained, whether for the satisfaction of the intellect, or for the latent pathological meaning they may convey to us; and especially, further, that when we have learned to question nature we find she has much more to tell us, even on trifles, than we had expected.

The idea of a collective investigation of diseases, in which every member of the medical body shall have his effective part, though obviously not to be realised at once, not indeed until the sun of science, which is the true Apollo of Medicine, has risen far higher in our sky than now, is yet one that at once challenges our ready and best efforts for its realisation.

Whilst the morbid anatomist is engaged in our hospitals and medical schools in demonstrating the effects of disease on the several organs and tissues of the body, we desire that all the practising members of the profession over the country, in the colonies and in other parts of the world,

should assist in the inquiry as to the origin of diseases :— their early symptoms ; their mode of spreading in families ; their combinations ; the causes of their intensity ; their modifications in individuals, in families ; their occurrence according to time of year, locality, sanitary conditions, occupations, and many other circumstances, some as yet but dimly discerned, and others not yet suspected. The value of this movement will, I believe, be obvious to all after but little consideration, for it will be admitted that had we leisure, proper means at our disposal, and, from previous training, a fitness for exact observation, we should find in general practice one of the most valuable fields of pathology, as here and here only we have before us the earliest signs of departure from health, and the only opportunities for tracing the course of a disease from its beginning to its end. Having passed many years in hospital and private practice, I have come to see that experience gained in the latter is necessary for the correction of that acquired in the former, and especially as helping towards a truer pathology of cases.

In hospitals we have more largely to do with organic lesions, with isolated cases of acute inflammations or developed fevers, and in all with an incomplete personal history and without any family record. We cannot thus learn with any exactness either the beginnings or endings of disease. Patients come under observation with their maladies far advanced, and they often pass from observation but imperfectly cured, thus leaving fallacious histories both in pathology and therapeutics : and if they die, morbid anatomy can often give but a confused and inextricable mass of facts, which it may be difficult or impossible to put into their true relations. One might as well hope to determine the physical geography of a country, by measuring and analysing the contents of its rivers as they fall into the sea, as to reach a true pathology from studying alone the results of disease on the *post-mortem* table. Let it, however, be remembered that we still insist upon the fundamental necessity of morbid anatomy as the only basis of true advancement. I am glad, therefore, to be informed by Dr. Mahomed that it is in contemplation to associate paid pathological experts and morbid anatomists with this movement.

By such means alone can we make our results permanent stepping-stones for those who follow us.

As a passing illustration of what is here insisted upon respecting the relation of pathology to morbid anatomy, and as indicating what we may expect from wider research, pardon me if for a moment I refer to renal diseases. One of our recent and best writers on the subject concludes by expressing his conviction that "there is but one Bright's disease;" this honoured name of Bright defining a state found after death, and fixed upon as the battle-ground of renal pathology—and I see that the latest statement of to-day, drawn from experiments on animals, is to the effect that destructive changes in the kidneys have but one form and lead to but one result in the tissues of these organs.

I appeal, however, with some confidence to our present limited experience in general practice, and with more to that wider experience which will be gained by collective investigation, whether there are not to be found quite different beginnings, quite different courses, and conditions requiring quite different therapeutics for that which in the *post-mortem* room is regarded but as one pathological state.

In disease one stream of morbid action naturally falls into another, and whilst morbid anatomy gives us the final synthesis of results, there is but one possible means of analysis, and that through noting beginning, order, and progress. Diseases are apt to so far assimilate as to become much alike towards death.

Believing as I do that more than we dare now expect will grow out of collective investigation, we must not be over-sanguine as to its immediate fruits. The essentials for success are not only the *numbers* but the *intellectual organisation* of the movement. If we aspire to have the arms of Briareus, we shall need the eyes of Argus; for Nature is very much a Sphinx, answering no question put to her if it be open to evasion,—yet truth lies on the surface if we had minds free from prejudice to see it.

The plan of this movement at present is to draw up memoranda on the several subjects for inquiry, and to issue with these cards of questions to be answered. Already such and important memoranda have been issued on acute

rheumatism by Drs. Goodhart and Barlow ; on acute pneumonia by Drs. Sturges and Coupland ; on inherited and acquired syphilis by Mr. Macnamara and Dr. Barlow ; on diphtheria by Mr. Shirley Murphy ; and questions on the evidence of the contagion of phthisis by Dr. Burney Yeo. This plan leaves nothing to be desired.

Nothing can be more useful and instructive than such memoranda. When extended over the whole range of medicine, they will place before the practising members of the profession in every locality, more or less succinctly, the state of our knowledge on the different subjects proposed for inquiry, and they will, whilst they indicate what we want to know, inform us of our ignorance on the various subjects.

The main difficulty lies in properly formulating the questions to accompany the memoranda. They must of necessity be so simple, pointed, and incisive as to admit of no vague answers. This, without saying it, calls for a great amount of knowledge and intellectual combination, and no slight mental perception ; for rightly to ask questions of nature is the highest science of the intellect.

This is, indeed, the vital centre of the whole movement. If the committees issue for any inquiry a definite question, and that being settled, follow it up by another, and so on in series, nature must at last be driven into a corner, and be obliged to say "Yes" or "No."

If it be that truth is hidden in nature as a stimulus to the intellect in the general pursuit of knowledge, to us this obscurity of things has a double meaning where duty and interest come in to urge forward the pursuit.

And here we ought to remind ourselves that if there is an experience which teaches, there is a much larger experience which is fallacious. Hippocrates rightly begins his aphorisms with this reminder.

Numbers without perfect organisation can effect but little or nothing. We require not only the fulcra of ascertained facts upon which to base our movement, but such intellectual combinations and direction of effort as is in a manner required in mechanics. If, says Bacon, men had attempted mechanical labours with their hands alone, and without the power

and aid of instruments, as they have not hesitated to carry on the labours of their understanding with the unaided efforts of their minds, they would have been able to move and overcome but little, though they had exerted their utmost and united powers. Yet men, he adds, are hurried on by senseless energy and useless combinations in intellectual matters, as long as they expect great results either from the number and agreement or the excellence and acuteness of their wits.

And we may add, that as great mechanical results cannot be obtained without engines framed by the wit and hands of many men, neither can a knowledge of such facts as we have to deal with be attained without an exact mental and numerical combination of the members of our profession.

It will perhaps be objected, and naturally, that it is almost impossible to organise for any useful purpose the labours of men already overburdened by the cares and fatigue of practice, and that there is neither time nor fitness for delicate inquiries on their part. Admitting that this objection is valid, it may be urged in reply that it need not be insuperable ; that if this movement makes some demand upon the busy practitioner, he will (as remarked by Mr. Macnamara in his speech on this subject at Birmingham) in proportion to the help he affords in carrying on this work successfully, receive back quite as much as he gives ; that further, it cannot be denied that when we see the meaning of the apparent trifles which in practice would otherwise oppress and worry us, our burden is thereby much lightened, and that nothing could encourage us more than to feel that even one daily observation recorded was adding to our general store of knowledge and making the path of practice more easy. There is no tonic to the mind greater than the sense of work done ; and our journey is likely to be made shorter, as it certainly will be easier, if the way is illuminated.

We, indeed, owe it to those members of our profession who are admittedly overwhelmed by the apparently senseless details of their work, to promote a movement like this, the object of which is to bring order into their chaos, and to help them to stamp a scientific value upon facts hitherto

only burdensome. If we compare the unflagging interest of any pursuit where the aim is high and clear, with the tediousness and wearisomeness felt when working in the dark, we shall readily admit that we are actually lightening the burdens of practice by thus adding to them, and by giving some portion of them a sense and meaning.

It is the spirit of a man which enables him to do his work lightly and cheerfully, and he will certainly be helped in this by a combination with fellow-workers on the same subject.

There is, however, a further consideration which should weigh with the practising members of our profession; this combination for the purpose of extending medical knowledge is an important duty in itself to all concerned. For, however slowly and at first imperfectly such a combination may operate, the smallest progress is a great gain to society and to our profession, and if favoured as it plainly claims to be by all the members of it, and helped by the efforts of our best minds, it cannot but in the course of time lead on from what is now but dawn to daylight.

As to the objection on the score of fitness, if this were urged as an argument against this movement, it would stand self-condemned on every ground; for if the members of our profession are unfit to observe, they are largely unfit to practise. Probably not so much as this is meant when it is said that the working members of the profession cannot help us, but rather that until the special workers in the sciences of physiology and pathology have made more advance, it would be useless for untrained practitioners to attempt anything novel.

But we believe this to be one of the fallacies of the day, and one of the causes which retard the progress of practical medicine.

Without in any degree depreciating the more recondite study of physiology and pathology, whilst indeed hailing with thankfulness the light such studies give us, and honouring those who in that behalf work for us, we may fairly maintain that we have been too indifferent to the value of the facts which lie nearest to us in our daily work. The feeling that only experts in science can do anything,

and that we must wait until they, from their centre, move us, or we shall not move successfully, is only partially true.

To say that this Association is beginning at the wrong end, is to misapprehend how knowledge is gained. The history of medicine is in our favour. We do not wait to discuss the nature of sensation, and how it is that the peritoneum is painful in inflammation, before we give opium for its relief. Currie proved the use of cold affusion in fever, more than half a century before physiologists began to suspect that there was a nerve-centre in the cord for controlling animal heat, and as yet they have not taught us specially how to utilise their discovery. We have long known the curative effects of quinine in ague, though physiologists have not yet determined the operation of the *miasm-organisms* which are present, and may give rise to this disease. Laennec developed his method of physical examination of the chest, on the commonest and nearest principles. All practice obviously lies in a knowledge of proximate facts, and it is equally obvious that that practice will be the most guarded and exact, which is guided by a knowledge of all the facts, both near and remote; still we are not to esteem lightly that which is near because we are ignorant of that which is remote. It is good knowledge to have learned that fire burns and water wets; though obviously it is much better knowledge to know all the facts of combustion and wetting; the combinations; the oxidations; the adhesions; the capillary attractions; the amalgamations; the endosmoses; the exosmoses; and the many other molecular changes which attend these processes.

It would appear to be one of the faults of the medical education of to-day, which this movement may in some degree correct, to lay undue weight upon ultimate facts, whilst we neglect those which are near; to indoctrinate the student with the belief that if he can run off upon his fingers the supposed ultimate constitution of the gastric juice (about which we are still very ignorant), that he has learned something respecting the digestive process, or that by reciting the atomic composition of an organic substance

as muscle, he has learned something about it, though, indeed, nothing but what appertains equally to mere dead substance.

It will not be the least valuable result of this movement, if it correct our prejudices in these matters; and hence it has already been well observed that one of the effects will be *educational on the whole profession*, from the youngest student to the oldest practitioner, and, further, will quicken and keep alive a sense of docility, the want of which is the cause of that confirmed prejudice which we often call experience, and which blocks the way of progress.

If the eye sees no more than it brings with it the power to see, then any objection against fitness must be met by the several committees of the Association, when they issue their questions, by accompanying them with such memoranda as may instruct the working members in the way of observation in any particular direction.

We, of all men, ought to be the last to be discouraged by the small promise of beginnings. Had we been present at the dawn of organic life, we should hardly have predicted its wonderful processes as seen in past and present times.

This collective investigation has been started on the principle of giving significance to what has hitherto been neglected; it would therefore be directly contrary to the *animus* of the movement if we underrated the power and probable success of efforts which may at first produce but little fruit.

The first intention of the Association respecting this movement was to obtain a better notification and more complete statistics of disease; and this was carried out to some extent by Dr. Ransome in Lancashire and Cheshire, but apparently not much came of it. The present form of the movement is chiefly due to Dr. Mahomed and to the advocacy of Professor Humphry at Cambridge in 1880, and subsequently to the meeting lately held at Birmingham.

Fifty-four committees have been already organised, one of the branches having six committees, and another four. These committees include from eight hundred to one thousand of the chief practitioners in England, Scotland, and Ireland, already pledged to the work, Dr. Mahomed acting as

honorary secretary to the whole, and who may be called its moving spirit.

It is not my province on this occasion to indicate specially what should be the subjects for inquiry, or to discuss the memoranda which should be issued upon them, but I may perhaps be permitted to refer to the subject generally.

For instance, on the contagiousness of phthisis a preliminary difficulty occurs as to what is meant by phthisis. Does the term include all the cases of destructive pneumonic changes beginning from the apex, or only those of a distinctly tubercular type, cases beginning acutely with fever and hæmoptysis, and ending fatally in a few weeks, and others with pleurisy or bronchitis, and lasting perhaps twenty years, or only those springing up without much observation until the infiltration of the lung is far advanced? To properly distinguish the cases will be an affair of much difficulty, since they approach from various points and intermingle inextricably. If the evidence of the communicability of phthisis should appear to gain force by extended inquiry, it will then obviously be necessary to determine with more than common accuracy in which form of phthisis this communicability occurs. If only in the more chronic forms, then whether the phthisis of old age is to be classified in this respect with the phthisis of the young.

It is plain that if in this movement of collective research we see a land of promise lies before us, we must at the same time recognise that the way to it is by a narrow and dangerous path. For whilst truth must be accepted when it is proved to be such, nothing will be more pernicious than false conclusions and partial truth sanctioned by so large a body as this. The opinions of a single individual would have less weight, and would take longer to permeate a profession, than conclusions having the colour of authority. Error would be perpetuated by numbers interested in the fallacy.

Assuming, again, respecting this question of the communicability of phthisis, that the presence of bacteria in the expectoration is characteristic of the disease at a given

stage, we should then have to determine whether they were present at all stages, and whether the phthisis bacterium received its specific form from the exudation in which it was found, or whether its presence determined the specific form of the exudation. The fallacy of putting effect for cause is here imminent, and families might be broken up and society much alarmed by conclusions having but little foundation.

As genealogical trees, showing the rise and extension of families, with their many collateral branches and inter-marriages, are found in great houses, and are regarded with pride and veneration; so we could wish that in a like manner *life-histories* were found in every family, showing the health and diseases of its different members. We might thus in time find evidence of pathological connections and morbid liabilities not now suspected: and we might discover means of prevention by a better knowledge of the origin and extension of maladies through blood-relation. The proposal of constructing such family life-histories is an important part of this scheme of collective research, and more would certainly be gained socially by the genealogies of health and disease, their connections and causes, and by tracing the strength of the strong as well as the ailments of the weak in a family, than from such barren histories as I have referred to, which tell only of inherited fame, but do not indicate the way to perpetuate and augment the inheritance. Unfortunately there is a feeling of safety in ignorance, and there prevails in us a sort of blind superstition, a survival of the darkest ages of man, which makes us think that there is a kind of religious trust in not seeking too minutely into the ways of life, as if the intellect of man were the servant of impiety rather than as it is—the handmaid of all that is good to us. Again, there is another hindrance to our obtaining all we want in this matter of family history: “all men think all men mortal but themselves,” and there is a half-conscious sense of shame in admitting any liability to human frailties. This weakness makes it very difficult to obtain the truth we want, though we may well excuse it and believe it to be an instinctive tribute to the righteousness of Nature’s laws, and an

unconfessed confession that many of our diseases are due to our own fault, and ought to have been prevented, as we trust they will be, through this movement, in the course of time.

This matter of life-histories is no new subject, though it is one to which this Association especially wishes to give a new impetus. All practitioners of large experience would be able to tell us something concerning the associated occurrence of diseases in families which are not generally supposed to have any connection between them. Dr. Cheyne, in his article on "Epilepsy" in the 'Cyclopædia of Practical Medicine,' says we conceive that epilepsy is as certain a manifestation of the strumous diathesis, as tubercular consumption, psoas abscess, &c. Now it is of course not to be maintained that tubercular disease and epilepsy are one state; but it does not seem improbable that diseases from hereditary defects of organisation may evince themselves in most different ways, and that there may be a common underlying bond of pathology between them. No advance of our knowledge on these and many similar points can be made through morbid anatomy. It is only through family life-histories that the subject can be studied. Such histories, incomplete as they now are, are often of great use in practice. Take, for instance, the anæmia and languor so much complained of in the girls of a family. Though, of course, such ailments are often due to the want of physical and intellectual training, they are by no means altogether so; and certainly the most difficult and intractable of them are not to be so explained.

We must in many instances have the life-histories of the parents or more remote ancestors, before we can fully unravel the causes of irregular menstruation, hysteria, anorexia, uterine flexions, and the like. And the same line of inquiry applies to the headache, pallor, dyspepsia, and seminal hypochondriasis of the males of such families. Further, take another example in acute rheumatism, upon which a memorandum and questions are already before the Association. The hereditary transmission of the rheumatic diathesis, its occurrence in intra-uterine life (as appears to be shown by some of the congenital cardiac malformations),

and its association with other diseases prevailing in the same family, throw a light on its pathology not be gained at the bedside or in the *post-mortem* room.

Life-histories, as Sir James Paget pointed out in his Bradshawe Lecture, would give us the genesis of new and rare forms of lesion; I hope I may add they would also show how the organic laws, favoured through generations, prevail over and wear out disease from the stock.

Again, if I may be allowed to refer once more to the still vexed question of the pathology of the contracted kidney and its relation to cardio-vascular changes, my friend Dr. Sutton and myself believe that it is only by a careful record of the life-histories of such cases that the matter can be settled. We believe it will then appear that the same pathological tendency in the arterioles may give rise to lesions in various parts and not in the kidneys only—to a retinal apoplexy in one, a cerebral apoplexy in another, to chronic changes in the cord or brain and cord in a third, to contraction of the kidneys in a fourth, and in all to muscular changes in the heart.

Family life-histories would show whether it be true or not that the ailments of childhood and age—eczema, bronchitis, diarrhoea, &c.—have a parallelism in their pathology. Certain it is, they have much in common as to their occurrence. In old age these ailments are called gouty, and in infancy and childhood catarrhal. It would be a point gained, if it were cleared up, whether in fact childhood is as gouty as age; or whether the word gouty, as applied to the diseases of the latter period, has any actual pathological value or not. If an old man's urine deposits largely crystals of uric acid, whether he be distinctly gouty or not, we refer it to that state; though such deposits are as frequent in infancy and childhood; the uric acid is the chief component in the urine of many creatures lower than man. Varied and numerous family life-histories might place on a surer basis our knowledge in this and a thousand matters.

Take the inquiries of to-day respecting infectious diseases and the increasing evidence that such states are due to agents which we may hope to fix and analyse. These, if ever completed, will still leave untouched a vital question in the

solution of which this collective research will have to take an important or if not isolated part ;—I mean how it is that the same poison acts with such varying intensity in different families ; in some the organism breaking down at almost the first touching of a poison ; others suffering but little, and others having almost or altogether immunity. Does this depend upon certain family peculiarities, and if so, what ? Does the immunity come from ancestors having passed through the ordeal, as occurs to the individual in vaccination and syphilisation ? Family histories will show us how far these immunities and susceptibilities extend ; and with what peculiarities of the nervous system they are associated, and how acquired. Allied to this inquiry is also that of the action of endemic poisons upon the new-comers into a district ; at which I can only glance.

In the early part of this address I asserted that collective research would give a new colour and meaning to many ailments, and show their relations to later organic changes ; and I will conclude what I have to say by referring to a set of ailments which very largely claims the attention of the practitioner, and a fuller investigation—I mean a set of cases whose life is nothing but ailment. Their physiology, if I may so express it, is a state of pathology. Their nervous systems are so sensitive, and their digestions so feeble, that they know nothing of that satisfactory resistance to disturbing causes from without which we call health ; and who often suffer as much from futile attempts to cure them, as from their congenital defects.

These cases supply a constant "*clientelle*," and I can hardly say how much we should add to the happiness of mankind by a better understanding of them. Of course I exclude those dilettanti *malades imaginaires* who may be said to enjoy bad health, whilst the class of cases to which I refer of right claim our greatest sympathy.

But I feel that I must not longer tax your patience. From the nature of the case it would be impossible to indicate, even in a cursory way, the many bearings which this collective research may take. One thing is certain : every question settled will but open another, and give renewed encouragement for fresh exertions. In all its

aspects this project set on foot by the British Medical Association cannot but advance the highest interests of our profession, and the more surely in proportion as it extends our knowledge of the prevention and cure of disease.

This is the age of combinations, but I know of none which has a purer object than this of collective research, whose purpose is the investigation of truth for the good of man.

THE INTERNATIONAL COLLECTIVE INVESTIGATION OF DISEASE.¹

GENTLEMEN, FRIENDS, AND COLLEAGUES,—I esteem it a great honour to be deputed to address you on this occasion, and on a matter which promises to contribute to the advancement of medical knowledge by a wider and fuller method than has yet been sufficiently attempted.

The subject of my address is the institution of an International Collective Investigation of Disease. This object, I need not say, is intimately connected with the main purpose of these Congresses, if not indeed in the natural course of things an integral part of them. At present we come together as individual cultivators and practitioners of medical science, each contributing his quota to our knowledge on this or that subject which may or may not have been selected for thesis and discussion beforehand. Nor are our labours, even under these conditions, without excellent results. But a feeling is growing and already widespread, that by a more organised combination, a more intimate and better co-operation, not only the members of these Congresses, but all the working members of our profession throughout the civilised world, might sooner or later be organised into a body of fellow-workers, associated for collecting information on medical questions over the widest area.

¹ An Address on the formation of a Committee for the International Collective Investigation of Disease, delivered at the Medical Congress, Copenhagen, August, 1884.

There is perhaps no profession which enforces upon its individual members so strongly as does medicine the necessity of continued observation and intellectual cultivation ; and there is no means by which this cultivation can be so well promoted as by meetings like the present, and by the active organisations in the form of committees or sub-committees which we hope and anticipate may spring from them.

The human intellect in its single and separate operation may produce wonderful results. Yet isolated as a man may seem to be in the intellectual labour which occupies him, he makes but little progress apart from the aid and co-operation of other minds which have worked and are working in the same direction. And though doubtless it will always be the privilege of the highest intelligences to clear the boundaries of knowledge, and to throw the rays of their genius into the surrounding darkness, yet all must be agreed on the great and almost supreme value of the intellectual co-operation of less gifted minds in the simple observation of facts, and especially when the needed facts are scattered over a wide field.

However much apart, as I say, a man may seem in the work of his intellect, he is really much less so than he seems to be ; for as we cannot refer the strength of our bodies to any particular food that we have taken, so neither can we track the thoughts of our minds to the sources whence they may have been fed ; and if our social nature has been raised from savagery to civilisation by social combinations, it is even more necessary that our intellectual nature should be helped in its growth and nurture by such intercourse and association as are here presented, and which we now propose further to advance.

Our great countryman, Bacon, has not generally been well received in the school of German philosophy, so that I must use some caution in citing him in favour of intellectual combinations in pursuit of the sciences. Still, on thinking over the bearings of Collective Investigation of Disease, I could not but feel that although three centuries have elapsed since he broached this question, and little has been done in it since, we might be about to realise his idea of a *Novum*

Organon, the formation of a New Intellectual Machine for removing and overcoming the obstacles to our medical progress.

The purpose we have before us is no less than this, to enlarge and methodise intellectual co-operation, whereby not only the active, but the at present inactive, faculties of observation of the wide-spread members of our profession may be combined into one or more lines of energy. I am not unmindful how much this pre-supposes; how it assumes the combination of exact observation and record, with refined criticism and analysis; how it demands the highest scientific perception, with the humble collection of the meanest facts;—how, in fine, it means the development of intellectual combination into many forms of organisation which should be not one but *many instruments of research*. Such a forecast may perhaps lead us to exclaim: "Who is sufficient for these things?" Yet happily the answer is near: Time, though short for the individual, is inexhaustible in the race; the intellect is in its infancy; its powers of growth unexhausted, and to these in their evolution there appears to be no limit. The work to be done is unchangeable; and there are eager and willing workers in all lands, who only need encouragement and direction of the master-minds of medical science to set them to work.

Happily the phenomena which demand our investigation, though complicated and transient, are, it need not be said, the result of unchangeable laws. The capriciousness of Nature, as we speak of it, is but the weakness of our own sense and understanding; and its so-called mystery and obscurity, but the darkness in ourselves.

The physiologist and the pathologist have to admit that not even in the caprices of man is there capriciousness; that mental caprices have their organic basis; that the whims, the fancies, and the prejudices of the human mind, not less than the changing activities of the functions of his body, or the revolution of the earth on which he lives, are but the resultants of unvarying laws, unchangeable as the fixity of the stars on which he gazes with wonder and admiration.

We may therefore have this encouragement, that when

any of our work is done, however small and trifling it may seem, it is done and settled for all time, or at least so long as the laws of organisation remain what they are ; that the clearing of a fact in respect of disease will remain an imperishable inheritance of knowledge to those who follow us, so long as there is disease in the world. We may support our labours, therefore, with a feeling of surety that the problem before us is a settled problem, however difficult its solution. Nature will not delude us, however much we may delude ourselves.

A superficial survey of the sections of this Congress shows that the student of medicine occupies an unique position in the pursuit of knowledge. For instance, if I turn the leaves of the programme, I find that the Section of Anatomy invites attention to cell-nucleus and cell-division, the lowest unit of organisation ; and the Section of Psychiatria to the psychic-epileptic equivalent, which, as no one will deny, stretches to the other pole of knowledge ; hence, surely no man more needs to lay hold of the unchanging idea of law than the student of medicine, as he ranges from one extreme of observation to another.

In the International Investigation of Disease, the prevalence of mental disorders in different nations will be a subject of inquiry. Also the forms which these maladies take, according to nationality, occupation, stratum of society in which they occur, &c. ; the use of stimulants—alcohol, opium, hemp, tobacco, &c. This work obviously lies not only in the physical and physiological conditions of life, but in their intimate correlatives, the facts of psychology. The thoughts of the student of medicine must range from the atoms that build up the textures to the hopes that make the man. And even perhaps further than this, for in most of us the unsatisfied mind cannot answer itself with the measurables and ponderables of physical science, however much it may admit that all else is dependent upon them, but will strive to go behind appearances and feelings to the substratum of their existence, and cannot find rest for its foot until it traces their relation to an unchangeable First Cause.

Du Bois Raymond might well remark that the problem

of organisation would be comparatively easy if it were unattended with feeling and thought. That it would then, as it were, present us only with an astronomical problem, in which the atoms of things would, after the manner of the heavenly bodies, move on in their several orbits in lines which science might hope to deal with. For it is within the scope of science, even as we now understand it, to track an atom of oxygen, nitrogen, hydrogen, or carbon through its synthesis in a plant to its combination in the elements of brain or muscle, and still on to its resolution and return into its original form, with corresponding evolution of force. But when this shall have been done, we have learnt nothing of pain, nothing of emotion, nothing, indeed, of the science of many of the common facts with which medicine has to deal every day. How different would be the problem for the physician if disease were unattended by pain or emotion, if the patient were indeed patient as unorganised materials are; if there were no hopes or fears on the part of the object to be dealt with, and no embarrassment on the part of the practitioner from desire to please as well as to heal! Quacks would then be banished to limbo. The course of nature could be watched until the equilibrium of health was attained, and the temptations of polypharmacy would be no more. But then, on the other hand, we should have nothing to do with life in its higher form, which is our ever-abiding problem, and we should miss the stimulus of affection, which, like a constant trade wind, carries us forward—at least the majority of us.

If for these preliminary remarks I need any apology, might I not say that I have come from the country of Newton and Harvey, that I have travelled by the home of Spinoza, and that I am speaking in the presence of the countrymen of Descartes and Leibnitz.

Gentlemen, I do not appear here to-day on my own behalf, but on behalf of the Collective Investigation Committee of the British Medical Association.

The British Medical Association is an Association of most of the Medical practitioners in the Kingdom of Great Britain and Ireland; and it has, I believe, affiliated Associations in our Colonies.

It numbers from ten to twelve thousand members, all, or almost all of them, actively engaged in the practice of medicine.

It is organised into over fifty branches, with their presidents and committees.

These branches have weekly or monthly meetings for the purposes of professional intercourse, and for reading and discussing papers on medical subjects. It has, moreover, a weekly journal of very extensive circulation, which records the transactions of the different branches, and supplies to its members lectures and communications on the most important current subjects in medical science.

This Association has been founded over fifty years.

For some years past, and especially during the last four years, it has been felt that the aims of this great Association might be advanced to a higher point by establishing an organised plan of medical observation amongst its members, and, already, sub-committees to the number of fifty, comprising as many as a thousand members, have been established to carry forward this proposition. I am deputed by the Central Committee of this Association to ask you to-day to extend this combination by establishing an International Committee for the Collective Investigation of Disease, and I trust this may commend itself to the Congress.

Such an International Committee would have objects entirely germane to the recognised purposes of the Congress itself. Probably one might go even further, and say that such an International Committee should form an integral part of these International Medical Congresses, and that their operation would in time become one of the most fertile sources of international medical advancement. I am happy to think that but little argument will be required in this assembly to commend this proposition to your favour. Already in Berlin the "*Verein für innere Medicin*" has adopted the principle, and has established a committee, after the pattern of the British committee, to carry forward the work. The President of the Society, Professor Frerichs, has given his entire adhesion to the movement, and Professor Leyden has accepted the Presidentship of the Committee

itself, which includes also very distinguished names ; and I hope that one or more of our colleagues from Berlin will to-day add a few words in favour of the proposition I am called upon to make.

In putting arguments forward for the establishment of a National Collective Investigation in its more limited form, it was permissible to insist upon minor advantages to be expected from such association—I refer to its educational value, since it could not but happen that every co-operating member would learn much from the investigations proposed ; and that whilst he promoted science, he would no less promote his own intellectual status.

Again, I pointed out in my Address in London, that the family physician or practitioner has a sphere of observation specially favorable to the study of etiology, and modes of extension of communicable diseases. He has also special advantages for pathological study, which are not so much afforded to the professor in a university or hospital. It is his privilege to see the earliest beginnings of disease, and to have the opportunity of tracing its evolution and decline, or when so favorable a course does not happen, the steps of pathological progress are before him, whereas at the end of life when the whole organism crushes downwards into a chaos of pathological forms by the advance of disease it is often impossible on the post-mortem table to say where the failure began, and how it has advanced. The family physician's observations should thus supply a corrective to a too exclusive mechanical pathology.

Amongst the subjects suggesting themselves to us in England in near relation to this matter, was the formation of life-histories and family-histories in respect of disease, and these could only be obtained through the family physician. If such histories could be widely and accurately recorded, the natural associations of different forms of disease in individuals and families would be made evident, and might afford suggestions as to pathological relations not now suspected—relations between diseases which are separated in nosological treatises, but associated in Nature. This mode of inquiry, through family history, would open a wide page for the record of the *pathology of ailments* ; a

page than which there is none more interesting to the practitioner of medicine, since seven-tenths of his work, and perhaps more than this, lie in efforts to correct physiological deficiencies, and to maintain some near approach to the equilibrium of health, which a feeble organism unaided cannot reach. On this part of the field it is that we can study the relations between functional and organic diseases, especially in the range of nervous affections, where the degenerative tissue-changes in one individual of a family may be compared with the physiological disturbances in another. It is also in these family-histories that we might hope to have elucidated the difficulties of *correlated pathologies*. Why, for instance, in a numerous family, whose members are living under the same conditions, one or two should become the subjects of pulmonary phthisis, one or two the victims of rheumatism, another of epilepsy, whilst the others maintain a healthy equilibrium. If such a history should be repeated in ten thousand or in a hundred thousand families, we surely might hope by careful collation of the facts, to come to the groundwork of these differences, and to determine the rule which separates the epileptic and the rheumatic from the inroads of phthisis.

So much for the more limited though not less important advantages of National Collective Investigation, but in an International Collective Investigation, the ground widens very much, not only from the different intellectual characters of its working members, but also from the greater variety under which disease presents itself.

The first gain, no doubt, will be from the intercourse and reaction of different national modes of thought, with and upon each other. It need not be said that the ways in which any subject may be viewed do not depend upon the subject itself, but upon the varied capacity of the minds brought into relation to it. Minds evolved during ages under special local and national conditions, and educated in lines of their own, cannot fail to give new direction and shape to the questions proposed for solution.

Each national mind will feel a different mental necessity. This view might be much further enlarged, if this were the occasion for it. At the Congress in London I endeavoured

to show that each nationality produces its own scientific school, and not least in respect of the science of medicine. One nationality is more distinguished by its powers of analysis; another by its powers of synthesis; one is critical, another historical; one characteristically anatomical, another physiological. Even if this occurred to only a limited degree, there must follow an interchange and fertilisation of ideas. And let no one believe that this is a dream. We have reached no more than the threshold of intellectual evolution.

International Associations like this will serve to nurse and nourish these powers in the future. But, however this may be, these movements and combinations are in accordance with the spirit of the age. It is on all hands felt and acknowledged that the individual worker, apart from his colleagues, cannot hope to do much in any department of science, and that it is only by combination of members and subdivision of labour that scientific observation can be carried on successfully. The establishment of an International Collective Investigation of Disease appeals to us from every side; personally, as through its influence our energies are stimulated, and our intellectual activity varied; socially, since observations made in one country cannot but correct or support those made in another; collectively, since science is cosmopolitan, and can only grow well when fed from all sources. It has been objected that the results of Collective Investigation must, from the nature of the case, be inaccurate, superficial, and so far useless; that they are more likely to confirm prejudice than to extend knowledge, and as regards their scientific value, science is made up of quite other stuff. Now to this it may be answered that knowledge advances in many ways; not only by the investigations of the gifted workers of science, but by the casual observation of an isolated fact. Indeed it has hitherto been objected, at least against the science of therapeutics, that more has been gained by accident than by methodical pursuit. The truth is, one step of knowledge, however gained, leads to another. The accidental infection of a milkmaid's hand, casually brought to the notice of Jenner in a country surgery, has not only contributed more than any other discovery to the

limitation or suppression of a loathsome disease, but it has opened up pathological speculations of a far-reaching character, and which to-day, in the hands of Pasteur and his colleagues, reveals the hope that we have the key to many if not all infective diseases.

All will admit that in the daily routine of practice, facts are occurring that are worthy of record, and that medical science loses much by the want of such record. By the combinations proposed, what are now casual and wasted observations would be methodised and stored for arrangement, comparison, and deduction.

The English Committee has proceeded as follows:—having first determined certain subjects for Collective Investigation, cards of queries have been framed and distributed through the different sections, leaving each member to select such subject or subjects as he might prefer.

As regards those life-histories of which I have spoken, patients and practitioners are advised to apply to the Association for blank books for these records. The head of the family or other person is directed to request the medical attendant, after each illness, to write a brief account of it, with any note he may be pleased to add; so that, after the manner of genealogical trees—which show the distinctions of a family through the heroic deeds of its ancestors—there should be a genealogical history in time to come of all the diseases to which its members have been subject from generation to generation. Such books might also become a record of health as well as of disease, and so show not only how families, and from them nations, decay, but how they grow. No doubt such records even of a thousand families would contain singular revelations, and place many of our pathological ideas in quite a new light. We might learn that with tendencies to organic disease there was less tendency to epidemic influences; that if diseases were prone to change their form and multiply, they were equally, if not more, prone to lose their forms in a reversion to health; that the occurrence of one disease might confer an immunity from another.

These life-histories might perhaps seem to have a more national than international value, but if they could be

obtained, they would supply material for probably the widest inductions. But there is this difficulty about them. Fear, as the wise man said, is a bad counsellor, and, unfortunately, the construction of these life-histories is beset with fear. There is a lurking dread in every man, and in every family, of exposing their frailties. This presents an almost impenetrable barrier to gaining the facts upon which life-histories are built. There is a fear also in the minds of the inquirers themselves, since there is a natural disinclination to intrude into secrets which are so anxiously guarded. But whilst we bear in mind the wise man's dogma, and remember that fear is a bad counsellor, we may resist its counsels as far as we can, where so much is at stake.

The clinical subjects which at present have been selected are acute pneumonia, chorea, acute rheumatism, diphtheria, and inherited syphilis. Cards of queries have been issued on each of these subjects, and each card is accompanied by a memorandum stating the object of the particular inquiry, and directing the attention of the observer to the queries proposed. These memoranda are of the first importance in this movement. It is on them that our hopes of success must be grounded. It is intended that they should indicate the defective state of our knowledge in the subjects brought forward for investigation. In doing this their value to the profession, and to the progress of our knowledge, is almost incalculable. It is no small matter to have set before us in a simple manner what the present state of our knowledge is, the defects which have to be made good, and the inquiries likely to lead to such a result. Text-books on medicine will hereafter have to follow something of this leading. Hitherto, and for the most part, they have aimed too much at satisfying the reader, and, in order to make the treatises complete, have assumed a knowledge both in pathology and therapeutics too little justified by fact, and so have hindered, rather than promoted our progress.

These memoranda are intended to be critical suggestions and suggestive criticisms on the state of knowledge respecting the subjects brought forward. They are the centre of the proposed system. It may fairly be expected that each

issue of them will be more exact and incisive. The successful framing of them is the one important object to be attained. Through them the influence of the more advanced intellects in the profession will extend through the whole of it, and will reach its most scattered and distant members. Nor can we doubt but that there will be a reaction from the periphery to the centre, maintaining a living cycle of active mental co-operation. Who can limit the effect of such action and reaction, or deny that there will thus arise new energy and new genius? for, happily, the cultivation of science need not remain the privilege of professors and teachers, but may become the common inheritance of all.

The volumes I hold in my hand are the first published records of the Collective Investigation in England. They contain reports and memoranda on the communicability of phthisis, acute pneumonia, chorea, acute rheumatism, and diphtheria.

I would refer, by way of illustration of my remarks on memoranda, to the memorandum on acute rheumatism. This recites our deficiencies on the etiology of this disease, and might also include its pathology; the exceptional ways in which rheumatism occasionally develops; its probable relation to the state of the nervous system; the new aspect of the pathology of joint-affections in relation to the spinal cord; the relation of the intensity of the rheumatic affection to anæmia; its clinical relation to tonsillitis; the intercurrent affections of the skin; and last, but unhappily not least, the treatment. I might add, however—not as a criticism, but as a suggestion—that an exhaustive memorandum on acute rheumatism, showing the real state of our knowledge respecting this disease in all its relations, and the more than vagueness of our treatment of it, would have a value which I should find it difficult to express. Long-standing prejudices, which for the most part are entertained and fostered as if they were established and confirmed experience, would go down before the exposition of such a memorandum, and its results in International Collective Investigation, as dry leaves before an autumn wind.

When inquirers on a given subject agree at the outset what are the imperfections of their knowledge respecting

it, they naturally combine the more heartily in its further investigation.

The aspect of an inquiry from a personal standpoint, and that from a collective investigation standpoint, present the most important contrasts. In the one, the Ego, however subordinated, is not lost. It lurks at the centre of the operations, and the results or supposed results of personal inquiry are too apt to be regarded as property, to be defended against all inroads, whether this property be worth defending or not. The observations and experience of any one man, however gifted, cannot be considered more than suggestive, and cannot have any authoritative value until confirmed by the repeated observations of others.

In a Collective Investigation, whether National or International, the individual and the results of his inquiry are obviously less open to distortion from personal favour or prejudice. This freedom from undue influence gives a greatly preponderating advantage to such associations as we are here met to establish.

Here the observer has no selfish interest in the result of the inquiry. His work will be equally good, whether immediately fruitful in positive results or not. The isolated observer, on the other hand, is apt to have interest in little else than positive results. In therapeutics the truth of this is too abundantly evident, to the confusion of medical practice, and to the vaunting of remedies and methods which are mostly of no value, or may be even worse than useless. It has not escaped the remark of the master of the logic of facts, that "*Habet enim unusquisque præter aberrationes naturæ humanæ in genere, specum sive cavernam quandam individuum, quæ lumen naturæ frangit et corrumpit—ut plane spiritus humanus (pro ut disponitur in hominibus singulis) sit res varia et omnino perturbata et quasi fortuita. Unde bene Heraclitus homines scientias quærere in minoribus mundis, et non in majore sive communi;*"—not in the common world, but in the world of themselves.

One can hardly forecast the amount of good influence on therapeutics if, instead of individual assertions respecting the value and success of this or that drug or method, we had the teaching of calm and impersonal results deduced

from an international area of inquiry, so large that the individual observer would be lost in the result.

Whilst our English association has, as I have described, put forward several subjects for collective inquiry with the memoranda and questions I have named, our German colleagues have determined upon a somewhat different method. They have selected but one subject for investigation, thinking it better to exhaust that before taking up a second or third; and they have naturally selected a subject which at the moment prominently occupies the attention of the profession in all lands, I mean pulmonary phthisis. Upon this they have proposed four points for solution:—(1) the heredity of the disease; (2) the communicability of the disease; (3) the cure of the disease; (4) the transition of pneumonia into phthisis.

These propositions are accompanied with many questions of detail which I will mention presently. The English Committee at the beginning of last year also proposed as a question for Collective Investigation the communicability of phthisis, and have reported upon it. The German inquiry is not yet reported upon. The important discovery of Koch that there is a specific organism associated with pulmonary tubercle, and his infection-experiments, have naturally excited the greatest interest respecting the communicability of the disease. It is well known that at different times and in different countries the contagiousness of phthisis has been confidently believed in; and as Professor Ewald remarked at a meeting of the Verein für innere Medicin, observers in America, in England, and in Germany have supported the belief in the contagiousness of phthisis by important records respecting it. Still, until Koch's discovery, the professional mind was very much asleep about it, or with only now and then a half-waking dream.

The English Collective Investigation Committee have put forward the question of communicability in the simplest form—"yes" or "no"—as follows: "Have you observed any case or cases in which pulmonary phthisis appeared to be communicated from one to another? Please answer, Yes or No." It will be observed that this is not a mere voting question as to a man's belief, but whether he has observed

any case or cases of the apparent communicability of the disease. "Out of the 1078 members of the Association who returned answers to the questions issued on this subject, at least 261 believe they have seen cases of phthisis which have originated in communication from one person to another; about 39 more have seen cases which have made them doubtful whether phthisis may not be so communicated; while 105 have offered facts and arguments which seem to them to negative such a view. One hundred and fifty-eight of the affirmative returns refer exclusively to cases observed between husband and wife. Communication between husband and wife is mentioned, together with other cases, in 34 of the remaining returns. So that 192 observers report cases of supposed communication of phthisis occurring between husband and wife."

There are also a number of special returns where the disease seems to have spread from patient to nurse, and from friend to friend. I am not here of course to discuss the pathology of phthisis or of its communicability from person to person, but to argue for the advantages of collective research. And, perhaps, no subject could be selected better to demonstrate these advantages than the supposed contagiousness of phthisis. By extending the inquiry over a wide area, the recurrence of striking cases of apparent communicability are repeated over and over again, and must naturally impress the mind more than a case or two occurring in individual experience. The Committee, therefore, justly remark in their report, that they hope that this first step in Collective Investigation into one of the most important questions connected with the etiology of phthisis, will be of value in leading to more open-mindedness in the discussion of disputed questions of experience and observation.

We shall await with interest the report of the Berlin Committee, for its Card of Queries is much beyond that of "Yes" or "No." It presents seven sections: (1) General questions as to the history of the family of the patient, the subject of phthisis. (2) Antecedents of the family. (3) Previous diseases of the patient; as, for instance, whether of phthisical habit or not; what diseases preceded the

development of phthisis, as scrofula, measles, whooping-cough, chlorosis, &c. (4) On the question of heredity follow queries on health of parents? either dead of phthisis? and when? have they suffered from scrofula? disease of the bones? lung diseases not phthisical? as pneumonia? pleurisy? gangrene? bronchitis? &c.; were the grandparents or parents related in blood? age of father or mother at the birth of the patient? were they sober or not? &c. (5) On contagiousness or communicability—was the disease taken from husband by wife? or from wife by husband? when the malady began? was the communicability between brothers and sisters or relatives or servants? was the contagion from residence in prisons, establishments for the insane, barracks, or infirmaries, &c.? was the infection by residence, clothing, or beds? by nourishment, as through the milk of scrofulous animals or consumptive nurses, &c.? (6) On the curability, including only such cases where at least two years had elapsed from the beginning of the disease—where did the arrest or cure seem to begin? did this come from the improvement of the general condition? are cough and expectoration gone? have the physical conditions altered, and in what way? &c. (7) On the Transition of Pneumonia into Phthisis—the day of the beginning of the pneumonia? its seat, as at base, apex, or middle of lung, &c.? right or left lung? expectoration—sanguineous? rusty? grass-green, &c.? signs of re-convalescence? when the first signs of tubercle occurred? &c.

I have stated just now that I appear here on behalf of the British Medical Association for Collective Investigation; but I have to add that it is my duty to lay before you further what has been done by the Collective Investigation in Berlin. Within the short time that the Berlin Association has been in operation (spring, 1883) its activity and success have been remarkable. The Berlin Association had already, in February, 1884, nine months after its establishment, fifty-five branches; and Herr Leyden reported to the February meeting of the "Verein für innere Medicin" a communication he had received from Professor Rauchfuss in St. Petersburg, informing him that they would establish there a separate Association for Collective Research, after the plan of that of

the "Verein für innere Medicin," and in relation with it. In Paris also, in the Société des Hôpitaux, there had been negotiations respecting the Collective Investigation of the "Verein für innere Medicin," and a similar one would be there arranged.

In the June sitting of the Committee, under the presidency of Herr Fraentzel and Herr Leyden, Herr S. Guttman, the secretary, reports that the German Association is daily making progress and exciting great interest; that on all sides, from Denmark, Sweden, Switzerland, Italy, Spain, and America, there were communications asking for information respecting this Collective Investigation, and with a request for the cards which had been issued.

With the "Verein für innere Medicin" there are associated of the Berlin Institutions the "Königstadt-Verein," the "West-Verein," the "Südwest-Verein;" and for the Associated Societies out of Berlin, there are correspondents for the Medical Societies in Rostock, Schwerin, Güstrow, Münster, Minden, Arnsberg, Regensburg, Paderborn, Aurich, Thüringen, Holland, Meran, Hagenau, Salzbrunn, Frankfurt (am Maine), Köslin, Freiburg, Prag, Elbing, Mainz, Hannover, Graetz, Bochum, Frankfurt (am Oder), Hessen, Wiesbaden, Dantzig, Memel, Marienwerder, Friedeberg, Lübeck, Chemnitz, Nürnberg, Bremen, Pommern, Breslau, Giessen, Dresden, Posen, Essen, Halle, Kiel, Basle, Göttingen, Liegnitz, Riga, Davos, and Marburg.

Further, there is an Association for Collective Research of the Institutions for the Insane, and already Herr Jastrowitz reports a combination of twelve of these institutions in different parts of the country. There is also a similar movement for inquiry into the health and the diseases of the inmates of prisons and infirmaries. In fact, our German friends have in many lines outrun us. Their exertions and their success in promoting this organisation make it superfluous for me to add arguments in favour of the proposition before this meeting.

I hope I may congratulate this sitting of the International Medical Congress in Copenhagen, upon the happy incident that we are to-day called upon to centralise these operations which have begun in England and Germany, into an Inter-

national Committee of this Congress, whose function will be to promote them in all lands ; and, by the continued co-operation of these Congresses, carry forward a movement, the fruits of which, as I have already said, it will be impossible to over-estimate, whether we limit our view to the results on our members, on the Profession as a whole, on the public good, or on the brotherhood of nations.

There is but one caution, and that lies against our attempting too much at first. In our scientific ambition it would not be difficult to o'erleap ourselves. It is by a little well done that we shall do much ; whereas, if our deductions are hasty, incomplete, and unfounded, the authority which will naturally attach to these researches will be much more obstructive to the cause of science than the fallacious dogmas of separate individuals. If our hopes and prospects are encouraging, the steps we take cannot be too wary. The purpose of our association could only lead to failure, and perhaps even a gigantic failure, if the movement were not waited upon by strict caution and exact criticism. If the work proceeds at the present rate, a few years will witness one of the greatest and most useful movements in modern times. The founding of an International Collective Investigation of Disease will promote the national movements of the same kind in all countries, and will give a stimulus to international emulation under the happiest form.

In the time at my disposal it is impossible to sketch even in outline the number of subjects which claim attention. The committees of the different Sections, as the work progresses, will select their subjects from their own point of view ; some with a broader purpose will take the more common maladies, and the more curious the rarer ones. One of our English colleagues would have concise descriptions of rare maladies, prepared as an entomologist would have them prepared of newly discovered insects, printing distinguishing features in italics. He instances Rhinoscleroma, Hebra's Prurigo, Morphæ, Alibert's Keloid, Keloid of Scars, Addison's Disease, Hodgkin's Disease.

Cretinoid State in the Adult (Myxœdema).

Congenital absence of special bones (such as radius and tibia, with associated portions of carpus or tarsus).

Cases of Spina Bifida, illustrating either results of treatment or survival without it.

Cases of Sacral Tumour.

Cases of Recurring Iritis in young persons.

Aneurisms in the orbit.

The Osteitis Deformans of Paget.

Disease of joints in Ataxy (Charcot's joint-disease).

Non-malignant growths in the tongue.

Hemiglossitis.

Kaposi's Disease.

The arguments for these more curious inquiries are not far to seek, since diseases which are rare in some countries may be frequent in others, and by their frequency afford the required ground for the study of their pathology. I might instance the glandular and elephantoid diseases of China, and the successful labours of Manson and Mayers, which have traced them to the presence of the *Filaria sanguinis-hominis*, producing lymphatic obstructions and filarial thromboses. The elucidation of such a piece of pathology, though the disease be limited to China, must have a good influence on the whole medical mind in breaking down preconceived opinions, and in showing that we cannot go too far afield for our knowledge. It supplies, moreover, a further argument for the International Collective Investigation of Disease.

Gentlemen, whilst I thank you for the favour with which you have received this Address, I cannot but express my deep sense of the imperfect way in which I have set forth the greatness and importance of my subject. I can now but commend the matter to your good efforts, assured that, through them, success will not be wanting.

THE ETHICS OF VIVISECTION.¹

It is to be regretted that the question of "Vivisection"² should still call for further discussion. It was reasonably hoped that after the result of the inquiry by a Royal Commission, and the subsequent legislation, physiologists might have been permitted to pursue their investigations, hindered only by the law as it now stands. This expectation was the more reasonable inasmuch as physiologists have loyally accepted the restrictions of the Act in question. But the anti-scientific agitation continues. Some opponents of physiological inquiry maintain that experiments on living creatures are altogether cruel, immoral, and disgraceful, and should therefore be entirely suppressed; others, yielding to the evidence of the importance and usefulness of these inquiries, but misled by a laudable dislike to the infliction of pain, would limit much more the sanctions of the law, and reduce these studies almost to a nullity; others, uninfluenced by either of these considerations, are opponents of vivisection as they would be of all other scientific progress.

Mr. Hutton, who tells us that a fair number of the articles in favour of a restriction more effective than that of the present law have proceeded from his pen, speaks of practical physiologists as "a new scientific class;" and of the encouragement of the practical physiological method as "a new departure," "a most significant and important new departure."

¹ Reprinted from the 'Nineteenth Century,' No. 61, March, 1882.

Note.—Sir William Gull's evidence before the Royal Commission on Vivisection was given on Nov. 6th, 1875, and appears in the Blue-book, p. 265.—ED.

² This term is inaccurate and misleading; but the question to the discussion of which I contribute is whether it is justifiable to perform experiments upon the lower animals, with every precaution against preventable pain in order to increase human knowledge and relieve human suffering.

Other expressions of a similar kind occur in his article, as of practical physiology being "a new profession," "a new movement." We should hardly have expected from so liberal a writer objections against any course of study because it was *new*. But happily on this score we can easily satisfy any prejudice against novelty. Practical physiology has the prestige and sanction of ages. Whilst Bacon speaks but lightly of the disputatious wisdom of the Greeks of the time of Plato and Aristotle, he warmly commends the physiological studies of Democritus and his colleagues. Galen's experiments are notorious; and the most learned author of the 'Anatomy of Melancholy' sets forth in his frontispiece Democritus searching for the seat of black choler:

"Old Democritus under a tree,
Sits on a stone with book on knee:
About him hang there many features
Of cats and dogs and such like creatures,
Of which he makes anatomy,
The seat of black choler to see."

It is, however, true that for many centuries physiological inquiry, and indeed the study of natural science in general, was almost stifled by the logic of the schoolmen, which better commended itself to the prejudices of men than did the harder task of observing and questioning nature. The commencement of a more prosperous era for physiology dates from the renaissance of science in the sixteenth century.

One of the earliest fruits of this revival was the discovery of the circulation of the blood, due, as Harvey himself informs us (though certain modern writers may wish to deny it), to "having frequent recourse to vivisections, employing a variety of animals for the purpose, and collecting numerous observations."

The contemporary discovery of the lymphatic system by Aselli, Bartholinus, and Pequet, the subsequent discovery of the capillary circulation by Malpighi, the great advances made by Boyle, and Mayow, and Lower, in the same century, were all the fruits of experiments upon animals; and ever since, physiology, no less than chemistry and physics, has depended on experiments.

The supposed novelty of physiological experiments does

not therefore afford an argument against them either in fact or principle.

That during the last few years physiology has received a new impetus from the great progress of experimental physics in other lines is perfectly true.

Until to-day the theory that the living quality in us was due to a mysterious vital force, out of the reach of science, preoccupied the mind, and stood in the way of observation and experiment. But now it has become the immovable standpoint of physiology that a living creature is dependent for all its bodily functions upon the forces of inorganic matter; in other words, that our corporeal life is but the operation of material atoms and material forces within the reach of experimental inquiry. The clearing away of old hypotheses and suppositions, and the admission of Physiology among the physical sciences, of course imposes upon her the same obligations of exact observation and experiment. She can no longer remain satisfied with specious explanations and fanciful hypotheses, any more than astronomy could accept the offices of the imagination for explaining the nature of eclipses or the causes of comets.

Physiology having thus set herself free from mental hindrances, and comprehending the extent and intricacy of the problems before her, must, from the nature of the case, claim as much liberty as astronomers and other inquirers enjoy in their several researches. But to prevent misunderstanding, it may be added that while firmly maintaining that the actions in living things are objects for scientific inquiry, and reducible to law—have, in fact, an order as fixed and certain as the stars in their courses—we are not so presumptuous as to suppose that when all these *actions* in a living body are made plain, we shall have penetrated the mystery of life. The living spirit which manifests itself in these operations can only be known from the consciousness and from the conscience. The eye does not see, neither does the ear hear. The odour of the rose and of the violet are not chemical, although they are chemically caused. If, therefore, physiology has a wide range, it has also its proper limit.

Physiological experiments, then, are no novelties; they

are as old as physiology. They correct erroneous doctrines, and are compatible with—nay, they lead to, a reverent conviction of the limits of human knowledge.

The more reasonable and respectable opposition to the method of experiment in physiology rests partly on imperfect knowledge of its necessity and use, partly on exaggerated estimate of the sufferings involved.

If physiology were a cruel and immoral occupation, in which what is gained is out of all proportion to the penalties paid for it, there would be no more to say but to blot it out at once. But if it appear, as it undoubtedly does, that physiology investigates problems of the highest importance to mankind, and that the solution of these problems is within the scope of the human intellect, then the matter assumes a very different aspect. It becomes in a high sense a moral duty to press on the acquisition of knowledge, both for its own sake, and for the fruits which it will surely yield. What casuist can doubt the moral duty, with the parable of the talents before him? Is it not at once the prerogative and the duty of the intellect, essential to its very maintenance and development, that it should have free course for inquiry?

Instead, therefore, of counselling prohibition, it would seem to be the part of lovers of knowledge to foster physiological inquiries, subject only to such restrictions as I shall presently show our men of science had already imposed upon themselves before they were recommended by the Royal Commission. But it ought to be noted that there are two sorts of inquiry, which may be confounded together; and Lord Coleridge, in his attack on physiological experiments, does not avoid this confusion. There is the inquiry of idle, vulgar, and impertinent curiosity, which is at best selfish, and may be immoral and even criminal. But this has nothing whatever to do with the inquiries of science, nor are its ways the same. Therefore when Lord Coleridge says that "liberty is claimed for experiment *in vacuo*, experiment on the chance, experiment in pursuit of nothing in particular, but of anything that may turn up in the course of a hundred thousand vivisections," he misplaces the claims of science, and puts them in the mouth of a monster of his own imagining.

There is in the language and statements of the opponents of vivisection an almost unbroken harmony of exaggeration. A lady, writing of the title of Claude Bernard, to be honoured by physiologists, says that such title is, at least partly, based on the invention of a stove which should enable him to watch the process of "baking dogs alive." Such a statement, without due context and explanation, and couched in such language, is calculated, if not intended, to convey a totally false impression both of the purpose and the details of the memorable experiments of Claude Bernard upon Animal Heat.

Baking dogs alive! How horrible and disgusting! would be a natural exclamation. What purpose could there be in anything so cruel? This we shall see directly.

Again, Lord Coleridge, apparently referring to these experiments on fever, says:

"I deny altogether that it concludes the question to admit that vivisection enlarges knowledge. I do not doubt that it does, but I deny that the pursuit of knowledge is in itself always lawful; still more, I deny that the gaining knowledge justifies all means of gaining it. To begin with, proportion is forgotten. Supposing it capable of proof that by putting to death with hideous torment three thousand horses, you could find out the real nature of some feverish symptom, I should say without the least hesitation, that it would be unlawful to torture the three thousand horses."

Now why, it may be asked, does Lord Coleridge, for the purpose of his argument, select *horses*, and why so large a number as three thousand? He must know that the horse has been but little experimented upon in the investigations respecting animal heat and fever, and then under the influence of ether, and therefore without suffering; the operation consisting in a division of the branches of the sympathetic nerve in the neck whilst the animal is insensible; so that the supposition of *three thousand horses* and *hideous torment* is an exaggerated supposition, out of proportion to facts—misleading, and in no way conducive to a fair judgment on the question at issue.

From the expression "baking dogs alive" anyone unacquainted with the subject would suppose that experiments upon animal heat and fever involve hideous torment, and from Lord Coleridge's expression, "to find out the real

nature of some feverish symptom," that these dreadful doings were for a trifling object. But a few words of explanation will put this matter in a different light.

In the whole range of nature there is no more wonderful fact than the uniformity of the temperature of the blood in health in the different warm-blooded animals. In man, dogs, cats, foxes, seals, &c., this temperature is uniform, whether they be living at the equator or the poles, whether in summer or winter, whether in activity or repose, whether fasting or recently fed, provided they are in health. In birds the natural temperature is higher by several degrees Fahrenheit than in warm-blooded quadrupeds; and it is a curious fact that if the blood of the latter be raised to the temperature of the blood of birds, the result is fatal. For instance, if a dog be put into a heated chamber, and his blood be raised to ten degrees higher than in health (the natural temperature of, *e. g.*, a swallow's blood), the animal quickly dies; and the same happens to man, whether this increase of temperature arise through injury or disease. The animal or man is, under such circumstances, "baked alive." Now, yearly in this country more than twenty thousand persons, children and others—mostly children—die of scarlet fever; and nearly twenty thousand more of typhoid fever; and one of the chief causes of this mortality is the high temperature of the blood, which results from the disturbance due to the fever process. To use Bernard's expression, "*le fait le plus important de tous, celui qui domine tous les autres, celui qui constitue le véritable danger, c'est la chaleur.*" No wonder, therefore, that physiologists and physicians have anxiously and laboriously occupied themselves in investigating that mechanism of the living body which in health maintains so constant a temperature under varying circumstances, both internal and external, and which becomes so easily and fatally deranged in disease. Thanks to the very intelligent and exact experiments of Bernard, part of this complicated machinery has been traced out; but the whole matter is so beset with difficulties that the wonder is, not that physiologists have done no more, but that they have explained so much. Those who carp and cavil may perhaps ask why, if these experiments are so useful, have we not been able more

certainly to control this fever state? The answer at present must be that the end is not the beginning; and that the complexity of one of the most wonderful of the many wonders of our bodily frame is not to be fully unravelled in twenty years. The subtlety of nature in a living organism demands the labours of many and various intellects before we can hope to obtain even a small instalment of the reward of their labours.¹ A living body is not a common piece of machinery, framed and fashioned from without; it is evolved from within, and every portion, even to the smallest, is a system in itself.

Bernard, in these experiments on fever, sacrificed two pigeons, two guinea-pigs, less than twenty rabbits, and six dogs. One might think that the slaughter of even three thousand horses (if they were suitable for the purpose) by a process far less painful than that by which thousands are sacrificed in war, would not be unjustifiable if thereby the machinery for regulating animal heat could be fully discovered, and the power of controlling fever put into our hands. Granted that such a sacrifice of life would only be becoming under the sanction and direction of very high intelligence; that provided, it would not be an extravagant price to pay for the redemption of even a part of those who die annually of fever, as Miss Cobbe says, "baked alive."

The twenty thousand deaths from scarlet fever, and the twenty thousand from typhoid fever, constitute but a small part of the annual deaths in this country in which the high temperature of the blood is a fatal factor.

The febrile state must have arrested attention from the infancy of man. The mothers of a palæolithic age must have watched their children consumed to death in it, as do the mothers of to-day. The name of this fiery state is as old as literature. Physicians have never been weary of writing on the symptoms of it. The thermometer we now use at the

¹ This is the meaning of Bernard's modest estimate of his own labours which has been so often quoted. The "legitimate promises" he made have been already in part fulfilled. No one can question the actual "performances" of experiments on animals for medicine after reading the evidence taken by the Royal Commission, or the papers by Professor Humphry, Professor McDonnell, Professor Fraser, or those which appear in company with mine in this review.

bedside bears the name of Fahrenheit, who, a century and a half ago, in concert with the famous physician Boerhaave, made exact investigations upon the subject. But it is only during this century, through the labours of many observers both in this country and abroad, and prominently of Sir Benjamin Brodie, that the actual conditions producing and controlling animal heat are becoming known. This fiery furnace, with its uncounted millions of victims, science hopes to close. And it is quite reasonable to believe that the time will come when fever will be as much under our control as are the movements of a chronometer.

If sufficient cause could be shown for giving pain to animals for the purposes of medical science, there would be little opposition to experiment. The sufficient cause would largely, if not entirely meet the moral difficulty. Mr. Hutton and Lord Coleridge object that such practices, for whatever purpose, are essentially demoralising, and tend to demoralise the community at large. These are strong statements, and would naturally require corresponding evidence to give them validity, especially as ordinary experience does not confirm them. If they were true, surgical operations would be demoralising, and a calling which is beneficent would rest upon moral degradation. The mother holds back the arm of the surgeon, and for the moment thinks him cruel, for the pain he is obliged to inflict on her child; but her calmer judgment acquiesces in the infliction of present pain for future good. Mr. Hutton thinks that the moral difficulty would be solved if we spared the lower animals, as we should expect to be spared ourselves were we in the power of a higher race. But it is impossible to conceive an order of nature in which intellectual creatures, having our moral relations, could stand to superior beings as the lower animals stand to us, and hence the moral rule proposed for the solution of the difficulty is inapplicable. Our obligations to the lower creatures arise out of ourselves. It is due to ourselves that we should treat them with tenderness and kind regard. Dominion over them has been put into our hands, and that dominion, from the demands of our intellectual and moral nature, must be intelligent. In killing and eating an animal, we are on the same level as

the carnivora ; in using them for our sports, we are on the ordinary level of man ; but in using them intelligently for the advancement of beneficent knowledge, provided that this be with a due sense of proportion between the benefit and the pain, we are justifying the highest purposes of our intelligence.

To ask why man should have to take such a course to acquire knowledge, is no more to the purpose than to ask why he is ignorant, or why he is placed here to subdue the world to his purposes.

That physiologists are not and have not been indifferent to or careless of inflicting pain is shown by the following resolutions, which have been already quoted by others, but will bear repetition. They were drawn up and accepted by the British Association in 1871 :—

“(1) No experiment which can be performed under the influence of an anæsthetic ought to be done without it.

“(2) No painful experiment is justifiable for the mere purpose of illustrating a law or fact already demonstrated.

“(3) Whenever, for the purpose of new truth, it is necessary to make a painful experiment, every effort should be made to ensure success, in order that the sufferings inflicted may not be wasted ;” &c.

These resolutions were signed by the President of the College of Physicians, the President of the College of Surgeons, and others interested in physiological inquiry. They make it sufficiently plain that the moral relations of science to animal suffering are not overlooked. And it is only in the case of *painful* experiments—a minority of the whole—that the moral question comes in.

It is no doubt a weak and unworthy argument, that the good we may obtain to ourselves by physiological experiment should outweigh the immorality of the process ; that our moral susceptibilities ought to be bribed and silenced by our selfish gains. If it were an immoral thing to eat an animal we ought not to eat it, even though our life were at stake ; nor ought we to touch an animal for physiological experiment if it were immoral to do so. It is therefore not true, as a prominent writer against vivisection asserts, that ‘the sentiments of compassion and sympathy must retreat and disappear,’ and be accounted of no consequence, in the

presence of the requirements of physiology. Nor is 'the deliberate torture of God's harmless creatures' in any sense a true description of the work of the physiologist.

The limits of our rights over the lower animals, and even over the lives of our fellow-men, can only be clearly discerned by the light of the purposes for which those rights are exercised—as in war and capital punishment, for the welfare of the State; in sport, for amusement and health; and in eating animal food, to give us energy. They are each defensible on their own grounds, and to deny them a reasonable sanction is to raise a cry against defensive war, field sports, and animal diet. There are delicate and sensitive natures whose prejudices in these matters ought to be respected as regards themselves; but it would be a woeful time for a country if their rule were to be made the rule of the State.

The far smaller sufferings inflicted by science are morally justified by similar considerations. That they are beneficent we have many proofs in daily life, and none perhaps more curious than the ground from which has sprung the very opposition itself to physiological experiment. This opposition is fostered by the larger and truer views of living things which physiology itself has taught. The improved feeling of even careless persons towards the lower animals, and the more enlightened sympathy which is felt towards them, is largely due to a better knowledge of their nature, and of the common tie of life which binds us to them.

It will appear to anyone who will be at the trouble to inquire even cursorily into the order of nature, that this order does not always accord with human views of benevolence; often it seems contrary to them. Our scope is necessarily limited, and the limit depends not only upon the benevolent feelings of the person, but upon his capacity for a comprehensive knowledge of the divinely-ordered system of nature.

It has been urged that it would be better to leave the progress of physiological knowledge to passive observation, and to give up experiments altogether. But it would be more reasonable to hope to make out the machinery of a watch by looking at it, than to hope to understand the mechanism of a living animal by mere contemplation. The

movements and the value of the levers in the limbs and joints might no doubt be largely made out by inspection ; but the deeper and more complicated machinery, part of which has been hinted at in the remarks on animal heat, could not be learned without the most elaborate inquiry into, and analysis of, combined living actions. This has always been strongly felt by those capable of forming a true judgment. Hence Harvey instituted an oration, to be delivered annually before the Royal College of Physicians in London, one of the conditions of which was that it should contain an exhortation to the members to study and search out, the secrets of nature *by way of experiment.* These orations have been continued from the middle of the seventeenth century to the present time. An unbroken testimony by those most capable of judging has been borne ever since to the value and necessity of physiological experiments. I will only quote the latest, and perhaps the most striking testimony ; which also refutes the slander that physiologists are reckless of inflicting pain. When the International Medical Congress met in London last year the following resolution was adopted at one of its general meetings :

“That this Congress records its conviction that experiments on living animals have proved of the utmost service to medicine in the past, and are indispensable to its future progress. That accordingly, while strongly deprecating the infliction of unnecessary pain, it is of opinion that it is not desirable, in the interests of man and animals, to restrict competent persons in the performance of such experiments.”

While the course of scientific medicine lies only in the track of discovered facts, those systems of cure which largely rest on theory are more independent of experiment ; and this may in some degree account for the indifference, and even opposition, which some medical writers have felt to experimental inquiry.

Let me offer two or three of the many instances which justify Harvey and the Medical Congress.

At Oxford, in February, 1665, there being present Dr. John Wallis, Savillian Professor of Mathematics, Dr. Thomas Millington, Doctor of Medicine, and other members of the University, Dr. Richard Lower made the following experiment. Having by him a small dog and a mastiff, he

opened the jugular vein of the smaller dog, and allowed the blood to flow until the animal was faint, and at the point of death. Then, to supply this loss of blood, he connected the carotid artery of the mastiff with the vein, and allowed the blood to flow into it until the fainting animal was restored. At the end of the experiment the vein was closed, the dog leaped from the table, forgetful of what had happened, rolled itself in the grass, and showed no sign of inconvenience. This experiment was a natural corollary to Harvey's discovery of the circulation, and has been the means of saving many lives. If it stood alone, it would be sufficient proof of the value of experiments on animals. The knowledge it afforded could not possibly have been obtained by passive observation or by fancy, and it rested upon the plainest demonstration. Moreover, the pain inflicted on the dogs by bleeding is a fair sample of a large number of the "hideous torments" of vivisection.

Magendie discovered by his experiments a way of medicating the body, which will be practised till the time arrives when "there shall be no more pain." He demonstrated that foreign substances in solution, put into the tissues, as, for instance, under the skin, were immediately absorbed, and so at once passed into the general circulation. This means of introducing remedies into the system is daily practised; sometimes, indeed, we have no other means, and when we have, this often affords the readiest and the quickest method of giving relief. No mere passive observation could have taught us this.

There are probably few symptoms more distressing and alarming in the course of common life than severe attacks of giddiness. By experiments on animals and birds it has been proved that these "vertiginous" affections are dependent upon irritation at the roots of certain nerves; and by the light of these experiments, and by observations on man, we have not only been able more exactly to appreciate the value of such symptoms, but to direct the use of our remedies.

Man is liable to convulsions from childhood to old age. Until Dr. Marshall Hall's vivisections, at the beginning of this reign, nothing was really known of the convulsive state,

but his experiments made it clear that a convulsion is a mechanical nerve-process, the beginning of which may be some trifling and removable irritation which propagates itself along nervous lines to their centres, to issue again in various directions to the muscles and other parts, much after the manner of the electrical force telegraphed to a central office, and thence outward in different lines. And all this may go on in our nerves without our being in the least conscious of it until the convulsion begins. Now, prior to Marshall Hall's vivisections, or to speak more exactly the vivisections of De Witt, who preceded him in 1751, it was more or less generally supposed that convulsions were due to the disturbance of some spiritual force within us; and, indeed, all the bodily movements in health were referred to this spiritual source. The very language we use conveys the thoughts of ancient times in respect of these matters—a "seizure," an "attack," a "stroke," point to some agency external to the body. It is true that philosophers, like Descartes and Willis, contemplating the bodily movements and studying their own consciousness, had arrived at the conclusion that a large number of our actions were as mathematically performed as those of an automaton, but they had no idea to what extent and in what way this occurred in us until the discoveries made by experiment.

The subject is far from exhausted as yet. When the automatic laws of nervous action are fully explored, not only (as hinted above) may we control fever, but, more fully than at present, those convulsive affections, for which much has already been done.

Even if no practical results had followed experiments on the nervous system, they might have been defended upon the ground of the lessons they have taught us of our own constitution. Even superficially considered they increase the wonder of our being. Those who have studied the structure of the eye with its various media nicely adapted for the refraction of light, have justly marvelled and admired. But what if they could view before them the mechanical arrangements of the nervous system, whereby day and night, waking and sleeping, the work of life is

done for us?—here maintaining an equable temperature of the body, there governing the chemical actions in digestion; from one centre controlling the action of the heart, from another the frequency of the breathing—and these actions carried on quite unconsciously to ourselves, and all the better without our attention.

Happily, experiments on the nervous system are far from being usually painful. The great majority are performed on decapitated frogs, or on other animals under the influence of anæsthetics.

As if this controversy on the rights of vivisection had not already had enough of feeling imported into it, Mrs. Kingsford would raise the cry of Atheism. She sees in the pursuit of physiological science a concealed attack upon all religious and sympathetic sentiment, and a repudiation of man's moral responsibility.

This accusation needs little reply. We need not here, in the cause of science, discuss the grounds of religious beliefs, nor the relation of scientific knowledge to religious conviction. We have it on the highest authority that "the kingdom of God is within us," and from the earliest time it stands recorded that we cannot "by searching find out God." Science has to do with that which is external to us, with our material nature, its forces and their relations; with what is ponderable and measurable. What lies beyond or beneath is relegated to other evidence and other tests, of which it may be said that they afford more certainty than even science can give us. There cannot be anything atheistic in knowledge, and science is nothing but exact knowledge. It would be as reasonable to assert that the south pole contradicts the north, as that science affords in any of her regions a negation to religion: on the contrary, as our views of nature expand, our conceptions of the First Cause become more and more reverent. This may, of course, not be true in every case; but on the whole, and taking humanity throughout, it is a certain and unquestionable result. But science cannot be too watchful against the intrusion of theory into her operations. The imagination, which in some minds is stronger than in others, is a dangerous ally in the investigation of facts. The exclusion of

this airy spirit from the laboratory is a different thing from a denial of the religious and sympathetic sentiments, or a repudiation of man's moral responsibility. Of natural philosophy in general Bacon asserts that 'it is, after the Word of God, the most approved support of Faith.' If he had known what experimental physiology has taught us of our internal mechanism and the deeper conditions of life, he would have had additional reason for his assertion.

It seems to have been supposed by some persons that medical students, from mere wantonness and for the practice of the hand, are in the habit of cutting up living animals. Those who are informed on the matter know that such a supposition is utterly groundless; and this was fully proved by the inquiry of the Royal Commission. One witness, indeed, hinted at such a fact; but when pressed for evidence declined to give it. No operations on living animals for the purpose of obtaining surgical dexterity have been or are performed at any medical school in the kingdom. No vivisectional experiments can be performed anywhere but in a licensed laboratory. In their Report the commissioners state, after a full inquiry: 'We have great satisfaction in assuring your Majesty that at the present time a general sentiment of humanity on this subject appears to pervade all classes in this country.' They quote the words of several witnesses, which are to the effect that, "in a medical school, anything like cruelty or indifference to suffering would be scouted by the public opinion of the students." To fix the charge of cruelty upon physiologists, the evidence had to be drawn from what is reported to have occurred in foreign countries or in distant times. In matters of daily life this would not be considered admissible. Not that English physiologists would wish it to be understood that they surpass their foreign colleagues in benevolence and compassion; but they would maintain that to draw a trustworthy conclusion from what happens in other countries, an exact and full inquiry ought to be made.

The sum of the matter seems to be that human life and the relief of human misery are objects which justify the infliction of pain upon animals, provided always that the suffering be no more than is necessary for the ends in view.

There is no doubt (and our more reasonable opponents, Lord Coleridge and Mr. Hutton, admit it) that physiological experiments are useful, useful for animals as well as for man. They are therefore justifiable, within the limits which were laid down by physiologists for themselves, and have been since enforced by legislation. Physiologists would unreservedly subscribe the principle, *nihil utile quod non honestum*. To the accusation of cruelty they may fairly reply, supported by all past experience, that nothing is so cruel as ignorance. For how many centuries had human sufferers to bear pain which is now preventible by better knowledge? How many thousands festered to death in small-pox before the discovery of vaccination? How many are now dying of tubercle and scrofula whom a better knowledge of these conditions might rescue? Yet the pursuit of this knowledge is hindered in England by the outcry of cruelty—the cruelty being no more than the inoculation of some of the lower animals with tubercular and scrofulous matter, in order to study the course of the disease and the modes of prevention. The cruelty obviously lies, not in performing these experiments, but in the hindering of progressive knowledge. Genuine scientific investigation should, in the interest of the nation, be fostered, not repressed by penal statutes. The welfare of all, from the highest to the lowest, is dependent at some time or another upon the knowledge which it brings. If to-day it inflict temporary pains, it annihilates their causes and their necessity in the future. It works to no selfish end, and for the most part its only reward is the fulfilment of its own high instincts. “The spirit of man,” says Solomon, “is the lamp of God, wherewith He searcheth the inwardness of all secrets.”

