Rational medicine : introductory lecture delivered at King's College, Oct. 1st, 1874 / by David Ferrier.

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INTRODUCTORY LECTURE

DELIVERED AT KING'S COLLEGE, OCT. 1st, 1874,

BY

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RATIONAL MEDICINE.

Gentlemen,—It has devolved upon me to deliver to you the introductory address with which it is the custom to commence the work of a new session. I shall be addressing many who have in previous years listened to a similar lecture, as well as others who are here for the first time. To all of you I have to offer a hearty welcome in the name of the Principal and my colleagues of the medical staff, and to express the earnest wish that those of you who are just commencing your studies may find in them all, and more than all, that pleasure and gratification which your most sanguine anticipations may have conceived.

The study of Medicine is one which, in many respects, presents peculiar attractions, dealing as it does with subjects which excite universal curiosity and interest. It is of a continually progressive nature, and offers practically unlimited fields for new and original observation and research; while the knowledge which is acquired gives to its possessors an enormous influence over the material and moral well-being of the community. At no other period did the medical profession occupy a position of greater influence and importance than at present, and at no former period in its history has there been a greater amount of intellectual activity

in every department of medical science. Gratifying as these facts are to all who are interested in the progress of medicine and of the medical profession, they carry with them graver responsibilities on the part of those who would worthily fit themselves for their professional duties. The time has long since gone by when medical students might be students merely in name—in attendance on, but far from attending to, lectures; visiting the hospital, but merely walking through it. Now they require to be, we hope are, and are sure you will be, most diligent and industrious; for you will have enough, perhaps more than enough, to tax all your best energies, during the few short years of your attendance here, to acquire even that amount of information necessary to carry you through your professional examinations, and infinitely more than that before you can be said to have a real knowledge of your profession. When you consider that the medical curriculum embraces almost the whole circle of the sciences, each of which, or even a single department of which, is sufficient for the study of a lifetime, and that all these subjects have to be gone through within three or four short years, and that you are expected to know something of them all, the prospect is somewhat alarming. Not merely have you to become acquainted with the characters and forms of disease, and the methods of recognising and treating it, but as a preliminary step you have to study the sciences of chemistry, botany and natural history, and anatomy and physiology. The impossibility of acquiring more than a very superficial knowledge of chemistry, botany, and natural history in the short time allotted to medical study, in which it is of the first importance that you should gain that amount, at least, of practical information which shall constitute you safe, if not reliable,

practitioners of surgery and medicine, has led to grave doubts in the minds of those whose opinion on medical education is of the greatest weight, as to the advisability of continuing these accessory sciences as an essential part of the medical curriculum. For, as regards the ultimate end of all your training—viz., the treatment of disease,—it can hardly be considered essential that a practitioner should be able to give the natural order or botanical characters of the rhubarb which he prescribes, or the class, order, and biological characters of the leech which he orders to be applied to a painful spot, any more than that the surgeon should be able to give a complete account of the metallurgy of iron, and the various processes in the manufacture of the scalpel which he uses. And no less an authority than Professor Huxley, whose life is devoted to science, would rather prefer as a medical attendant one who is entirely ignorant of botany or zoology, on the ground that one may be as good a practitioner, and in all probability better, if he has devoted all his time to the practical rather than occupied himself with the scientific branches of the profession.

But though much may be said in favour of this view of medical education, and of the desirability of concentrating the chief energies of the student on the study of those subjects, the directly practical bearing and monetary value of which can be readily appreciated by all, there is great danger lest these views should carry us to the opposite extreme, and lead us to consider that the chief and highest aim of medical education is to develop a race of purely "practical men," to the entire exclusion of that breadth of scientific and general culture which it has always been the boast of our profession to possess, and to which, as much as to its mere handicraft skill, it

owes its high position and recent progress. It is no doubt true that it would be well if our students could all begin their purely professional studies already well grounded in those accessory sciences of which we have spoken; but I am inclined to think that the disproportion between the proficiency achieved and the time devoted to them has been greatly overestimated. If only that knowledge of chemistry, botany, and zoology is of value which is thorough and complete, then the time which a medical student can devote to them is ridiculously insufficient to enable him to reach this standard. But a knowledge of these subjects infinitely short of such a standard is, in my opinion, of the utmost value. A medical practitioner need not be a thorough botanist, an expert chemist, or an accomplished zoologist; yet the time devoted to the study of sciences of accurate observation and careful induction will have a most beneficial influence in fostering similar habits of thought in the field of every-day practice,—and nowhere are they more needed. Besides which, there are numerous occasions in medicine proper where even a general acquaintance with these sciences enables one intelligently to appreciate and perceive important relations and analogies which otherwise would be impossible. Nor would it be for the advantage of these sciences themselves if they were entirely excluded from the medical curriculum; for the great majority of the distinguished scientific names in this country are the names of those who commenced their career as medical students, or of those who in the leisure moments of busy professional life have found means and time for the cultivation of the sciences for which at an early period of their career they imbibed a liking, and have crowned their names with honour, and embellished their favourite subjects

with numerous and valuable discoveries. While, therefore, there are some subjects which, in reference to the great aim of medical education—viz., the knowledge and treatment of disease,—we may, without disparagement to them, regard as of secondary importance, there are others which demand your most earnest attention, as constituting the basis of all rational medicine. Where all are indispensable, it may seem invidious to single out one as especially deserving of an unusual amount of your time and study; yet, in view of the prospects of medicine of the present day, I would desire to urge in a more especial manner the claims which Physiology has upon your attention. It is quite unnecessary for me to expatiate at any length on the importance of physiology as the groundwork of all scientific knowledge of the nature of disease. The science of the functions of the body in its normal condition must necessarily precede all attempts to interpret the phenomena of diseased conditions; and it is as bearing on function that anatomy and pathology derive their chief signification and importance in medical science I wish more particularly to insist on the necessity of a thorough study of physiology rather in reference to that which, after all, is the chief end of all your studies—viz., the treatment of disease. The tendency of modern medicine is to place therapeutics on a rational scientific basis, as contradistinguished from its present position—that of almost pure empiricism. Strange though it may seem, notwithstanding the thousands of years during which medicine has been cultivated, notwithstanding the numerous sciences which constitute what we call medical science, the term "science" is scarcely applicable to that department of it which relates to the treatment of disease by

means of remedies. We have, in the recorded experience of past and present generations, an immense accumulation of material, valuable and the reverse, relating to the influence of drugs on the progress of disease; but we are sadly in want of accurate generalisation, and the establishment of definite and precise laws as to their efficiency and employment. "To those who are acquainted with the successive stages through which medicine has passed, and who know the modes of thought and the methods of investigation which are followed by her most active promoters, it will not appear that we are indulging in vain hopes or idle speculations when we assert that the time is not far distant when she may legitimately rank as a science. Many, indeed, will believe that we are doing her but scant justice in questioning her present claims to such a place. It will, however, only be when general laws connecting disease with health and establishing a perfectly rational system of therapeutics shall be applicable to the whole body of medical facts, that the term 'science' will be legitimately applicable to medicine. Experimental pathology, studying the synthesis of disease,—and experimental pharmacology, localising the action of drugs on the tissues and organs of the body,—are fast following in the steps of the rapidly advancing science of physiology, of which they are but departments, and, young though they are, are furnishing the materials for a real science of medicine."*

It is but right, however, to inform you that the path here indicated as that which the medicine of the future ought to pursue, is not only not generally adopted, but is strongly opposed by a large class, who regard as misleading all attempts to rationalise therapeutics by reasonings and speculations founded on physiological or phar-

* Gamgee: Science and Medicine.

macological experiments on the lower animals, and who look upon pure clinical and pathological observation as the only safe and sure road to trustworthy and stable progress. In support of this position, they advance, among other arguments, the mischievous and pernicious errors which the history of medicine shows to have been the result of neglecting the method of pure clinical observation to indulge in theoretical speculation and physiological theories regarding the nature of disease and its rational treatment. How much this is justified in fact will best be rendered clear by a short sketch of the development of therapeutics, and the principal revolutions which have occurred in medical practice.

The art of medicine existed before there were any physicians. Man from his first existence must have had diseases and pains, which he strove to cure or alleviate. The first attempts were rude, and confined to empiricism of a very restricted form; and the scattered observations of individuals and the collected wisdom of tribes handed down by tradition from generation to generation furnished the first rudiments of therapeutic lore. In the early times the heroes and the poets were the chief repositories of medical precepts; the poets, especially, recording in their works whatever was curious and interesting in reference to "the beneficent art which prolongs life, allays pain, and restores health, and along with it happiness and pleasure." The priests soon seized upon the art of medicine. Medicine, like superstition, brings into action the same powerful principles, hope and fear, and exerts on the minds of men an influence proportional to their weakness, even the most enlightened being unable to resist its power. In order to establish the worship of their gods, the priests proclaimed a number of miraculous cures which

were effected in their name; and in order to gain greater reverence for their art, they made it depend on habitual intercourse with their gods. They preached and practised physic at the same time. They possessed certain remedies and vaunted specifics, which were regarded as powerful therapeutic agents; but, like many in more recent times and at present existing, they owed their chief efficacy to the wonderful power of the imagination. The priests, of whom Hippocrates was a descendant, notwithstanding their superstitious views, were the discoverers of many valuable hygienic rules. The ignorance of the people had spared physicians, or those who assumed the name, from giving a more rational or intelligible form to their art, and the credulity of the public, bred of the same ignorance, had accustomed the more enlightened to a culpable system of deception and habitual falsehood The philosophers, accustomed to system and logical arrangement, directing their attention to medicine endeavoured to free it from its superstitious character and incorporate it into their philosophical systems. This reform was of infinite service both to medicine and philosophy; but while rescuing medicine from undiscerning ignorance, they, by combining with it their systems of cosmogony and philosophy, precipitated it into a variety of hazardous conjectures, and delivered it over from the blindness of empiricism into the rashness of dogmatism. In proportion to the erroneousness of their principles did their practical rules tend in mischievous directions. At this early period we have exhibited the evil consequences of transferring to a practical art the principles of other sciences which were themselves in a crude state; and a parallel is drawn by some between the rational medicine of the present day

and the early efforts of the primitive philosophers—with what decree of justice will appear as we proceed.

Such was the state of medicine when Hippocrates appeared. He perceived with great acuteness the inconvenience resulting from the method pursued, and endeavoured to recall medicine from the path of pure speculation to "a contemplation of nature." "He saw clearly that nature pays no regard to the reveries by which we pretend to explain her operations, and that animated nature in particular has its peculiar processes, which we must study in the facts themselves, and not attempt to divine by vain conjectures or more vain calculations." Yet, oftener than once, Hippocrates himself yielded to the same predominant tendency of the human mind to theorise, which he strove so much to counteract. Instead of certain doctrines which had become antiquated, or had been refuted by his own observations, he substituted others which no doubt approached nearer the truth, but which nevertheless were nothing but mere conjectures unsupported by the irresistible evidence of facts. His theories of the elements, the temperaments, and the various qualities of the humours, and the way in which they were influenced by seasons and medicines, and his practice grounded on such theoretical physiology, were not free from numerous if not dangerous errors His errors were more due to the imperfect state of the sciences which constitute the scientific basis of medicine than to the method he sought to inculcate. For Hippocrates saw clearly that medicine, to become a science, must not rely on mere empiricism, but combine the facts of clinical observation with judicious reasoning founded on physiological investigation—a method more likely to advance medicine as a science than that of the

opposite school of the Empirics, which spurned all attempts to ascertain causes, and contented itself with the facts of individual unreasoned experiments. The medicine of Hippocrates is an illustration of the errors into which it may fall by allying itself with the principles of a physiology not founded on "a contemplation of nature" and on carefully conducted experiments, but on mere philosophical speculation. Owing to this alliance medicine in a great measure continued to be a battlefield of rival philosophical schools, the principles of which led to the most contradictory methods of interpreting and treating disease. Thus the atomic philosophy of Democritus led to a system of medicine founded by Asclepiades, in which all diseases were explained by corpuscles and pores; and the same principles guided the treatment, and accounted for the action of the drugs employed. Another sect called the "Methodics" regarded all diseases as dependent on constricted or relaxed fibres; and hence they treated them with laxatives or astringents respectively; while in the treatment of chronic diseases, which could hardly be brought under either head, they had recourse to their grand remedy—the analeptic or resumptive circle, which consisted in a succession of fanciful remedies applied at stated intervals and in a fixed order.

Such and similar theoretical views regarding diseases and their treatment continued for ages to constitute the so-called science of medicine. Each age has had its own peculiar taste and fashion; and at different times medicine has assumed the tone of the prevailing sciences; it has endeavoured to speak their language, and subject itself to the same rules, so that it has passed successively through as many systems as have acquired any degree of celebrity in the world. One of the most striking

revolutions in medical science was that which was effected by the development of chemistry, which was regarded by its votaries as capable of explaining every function in the body, the intimate nature of disease, and the rational theory of cure. The vital functions were looked on as the result of so many fermentations, ebullitions, or sublimations; and the varying proportions of the acids and alkalies, whether opposing each other with violence or uniting quietly, were regarded as the chief factors in the causation of disease. Their practice was guided by these physiological views, and their whole efforts were directed towards checking or favouring the development of acids or alkalies, or modifying the degree of fermentation. For this purpose they employed chemical remedies with an unwonted degree of boldness; and while they sacrificed thousands to their reckless experiments, they discovered some of the most valuable drugs which we possess, and to none more than to Paracelsus do we owe the greater number of our still highly-prized mineral remedies. These have remained, while the theoretical views which gave them birth have long since passed into oblivion and ridicule. During the seventeenth century medicine was again revolutionised by the mechanical philosophy of Descartes, and the great physiological discovery of the circulation of the blood by Harvey. In the attempts to rationalise medicine and therapeutics, geometry, algebra, and mechanics were applied with confidence by the mechanical physicians, both to explain the functions of the body and to direct the treatment of disease; and they imagined that the certainty of the instrument would be transferred to the practical results. The new light thrown upon the animal economy by the discovery of the circulation served to redouble the rage of sys-

tems. "Nothing else was thought of but to cause the blood to circulate more freely, to destroy its viscosity, to drain off from the body that which was supposed to be corrupt, to purify it, to correct it, to renew it, and to preserve the bloodvessels in a relaxed and pervious state." Hence arose the Sangrado system of bleeding and drenching, which the physicians of this school thought themselves called upon to exercise in their treatment of all sorts of diseases—a treatment which, more or less modified, long survived the theories which had originated it, on account of the beneficial results which were believed to flow from it, but which a more enlightened experience has seen fit to discard. That its victims were legion, few even of those who would re-introduce it into practice will seek to deny.

The past history of therapeutics gives us much reason to deplore the errors into which practitioners have fallen, and to which they have opened their eyes only for the most part after they have proved fatal to a number of unfortunate victims. In those sciences of which the practical application does not relate to our every-day events, or in which mistakes committed may easily be rectified, errors in theory shock the enlightened understanding; but in general such errors are not of serious or direct consequence. In medicine the case is very different. The application of the rules which the practitioner lays down is direct, and the least erroneous view leads to some consequences. We have to remember that the lives of our fellow-creatures are at stake. How many cruel and premature deaths, how many impaired and debilitated constitutions, have paid for the folly of theorists—follies which have almost always proved fascinating. "The study of a system is more easy than the investigation of nature, and in practice it seems to

smooth every difficulty. The mind loves to repose upon principles which it believes itself entitled to substitute in the place of observation; and when these have been diffused to a considerable extent, and have become a sort of creed for weak and servile understandings, if misfortunes accumulate and victims fall a sacrifice under the new scourge of humanity, they generally look for the cause of these evils in frivolous circumstances," and are tempted to censure the laws of nature, rather than question the propriety of their own conduct.

Thus far we have seen how well apparently the history of the various revolutions in medical science supports the views of those who regard the attempts to rationalise therapeutics as having been productive of mischievous effects, and of having led men away from the observation of nature. But it must be remembered that up to this time physiology and physiological anatomy can scarcely be said to have existed, what passed for physiology being merely a system of metaphysical disputations and scholastic wranglings, as to the nature of life and the essence of the living principle. It was not till the time of Haller, in the middle of the last century, that physiology as an experimental science began to be cultivated. Haller introduced the method of studying the functions of living beings by diligent observation and carefully-conducted experiments, keeping hypothesis entirely in subjection to these leading principles. Since Haller's time the progress of physiology has been uniform and uninterrupted in the path in which he set out. Instead of all the processes of life being referred to an unknown and unknowable living principle, the vital functions have themselves been studied and experimented on according to the true canons of inductive research. The functions of the living body have one by

one been investigated and explored; and of recent years, by the application of instruments of precision and exact methods, our knowledge of the circulation, respiration, nervous system, and the conditions of life in general, has reached a state of development which renders the physiology of past ages scarcely worthy of the name. Not that all the problems of vital function have been solved, or that the laws which have been established may be more than individual steps to higher and simpler generalisations, which shall explain numerous isolated and apparently contradictory facts; but the physiology of the present day pursues a path which is sure to lead to permanent truth, in recognising the rigorous necessity of experimental demonstration, and discouraging all attempts to solve difficulties by mere abstract speculation. It is easy to trace the enormous influence for good which this development of physiology and of minute anatomy, normal and abnormal, has had in explaining and giving precision to our knowledge of the phenomena of disease; so that, whatever opinion may be held as to the rate of our positive progress, we may regard a return to the speculative and erroneous notions of the past as wellnigh an impossibility. Yet it requires no lengthened examination to satisfy ourselves that, however accurate our knowledge of the true pathology of disease and the means of diagnosing it may have become, our knowledge of therapeutics has not advanced to a like extent, and that, as far as treatment is concerned, we are in a great mesure mere empirics, our only reason for the faith that is in us being that such and such a plan of treatment has been found beneficial by those who have preceded us. And yet, with all this empiricism, we observe how eagerly everyone—even the most rigid empiric, who sees in this

method the only satisfactory path in therapeutics—advances some theory in regard to the physiological action of the drug which he prescribes, and the evident desire he exhibits to support his treatment on some rational physiological or pathological foundation. The backward state of therapeutics as compared with the relative advance of pathology naturally suggests that the subject is one surrounded with difficulties greater than are experienced in any other department of medical science, or that the method pursued has not been calculated to arrive at scientific precision, or that possibly both causes may be at work. That the study of therapeutics presents difficulties not encountered in any of the physical sciences is a fact the truth of which is easily demonstrated, but which is too frequently ignored in the satires levelled at the medical profession by those unacquainted with its problems. Those branches of research which aim at the determination of the simple and invariable properties of bodies, or deal with facts the mutual relations or identity of which are easily determined, or with fixed and limited data, naturally make rapid and certain progress. The phenomena of life depend on so many unexplained causes, and are liable to be affected by so many circumstances which observation alone in vain endeavours to appreciate, that the relative problems, incapable of being stated with all their data, cannot be referred to exact calculation. Nothing certainly can be more difficult than to ascertain, with regard to the medicines we employ, the real share which they may have had in the changes that occur subsequently to their use. It is no easy matter to decide whether these remedies have really had any share whatever in the production of the changes observed,—there are so many accidental cir-

cumstances which may have given birth to the phenomena observed, or at least may have modified them in such a manner as to render it impossible to discover the true cause. And it is still more difficult by this method to discover the particular property which renders any remedy capable of producing any particular effect.

Man in a state of health, and much more so under the influence of disease, presents such a complex assemblage of phenomena that the discovery of causes by mere clinical observation cannot but be slow, and always uncertain. The uncomplicated natural history of disease is difficult to ascertain when the necessity for action is urgently enforced. Diseases vary, and have special features, imparted to them by the individuality of the patient; mental emotion plays an important part in the causation, progress, and cure of the disease; so that, to allow for all and each of these, as well as many others, to estimate the exact proportion which each has had in the production of the phenomena observed during the progress of treatment, to discount the deficiencies and imperfections on the part of the observer, to eliminate all collateral circumstances of personal or other interest in the results recorded, constitute a mass of difficulty which the experience of countless generations has not yet been able to resolve. For if we are to believe the recorded results of therapeutic research conducted under such complicated conditions, we shall be obliged to admit that the same diseases have equally well been cured by the interposition of the gods, by witchery and priestcraft, by the most sanguinary and antiphlogistic, and by the most mild and expectant treatment, by remedies founded on the rational pathology of the disease, by the administration of infinitesimal

parts of nothing, by peppermint water and bread pills. Each and all of these diverse plans of treatment have had their advocates, who bring forward in their favour accumulated masses of testimony, the result of extended experience. With such conflicting evidence as to the value of therapeutics, need we wonder that "doctors differ" has become a byword, and that many thinking men, despairing of certainty, have rushed into inveterate scepticism as to the efficacy of medicine in general, and have assumed the position of "benevolent neutrality," declining to interfere between the patient and the *vis medicatrix naturæ?*

It is in the nature of the subject, cultivated as it has been, that such a state of things should exist; but that we should rest and be thankful, as some would have us to do, and accept as ultimate facts conditions which may be merely accidental and capable of being overcome, is hardly in accordance with the spirit of scientific inquiry. For we may be assured that the imperfections, which we all admit exist, are not essentially inherent in the subject of investigation, but in the method by which it is cultivated. We must distinctly recognise the necessity of reducing the problem to more limited dimensions, and endeavour to bring the conditions of our investigation so under our control that we may modify them at will, or make allowance for them where it is impossible altogether to eliminate them from our inquiry. We require to apply to therapeutics the same rigid system of experimentation by which the other sciences, as physiology, have reached their high state of development. To deal with human beings in this manner is obviously contrary to the whole genius of the profession, which has for its aim to alleviate pain and cure disease. If experiments have been

made in former times with a degree of recklessness which cost many their lives, and inflicted much suffering on countless multitudes—experiments which have been the means of establishing many valuable results, of which we now reap the benefit,—even this age of vivisection repudiates such a course as inconsistent with the principles of true humanity. And yet, for the higher interests of humanity and the advancement of science, therapeusis stands in need of the most diligent cultivation by the most improved scientific methods. Nearly every positive fact in regard to vital function has been ascertained by the process of experiment on the lower animals; almost all that we certainly know in reference to the intimate structure of the animal frame and the real nature and progress of diseased conditions, has been gained by the diligent study of the tissues of the lower animals and the experimental induction in them of pathological processes. The results of the labours of physiological histologists and experimental pathologists are being every day verified, and transferred to our conceptions of the physiology and pathology of the human frame. Why should we not follow the same course in our endeavour to arrive at a true scientific knowledge of the action of drugs on the animal economy? This is the method which the progress of modern research points out as the only one capable of furnishing that accurate knowledge respecting the action of remedies which is too frequently vainly assumed in the names which characterise groups of drugs in our pharmacopœias—names which imply a theory of their physiological action founded often on the most insufficient evidence, or merely a more palatable form of expressing our utter ignorance of their mode of action. The true phy-

siological action of the agents we employ for the treatment of disease is absolutely necessary before we can combine a rational treatment with a rational pathology. To determine this we must have recourse to the method of experimentation on the lower animals.

Against this course numerous objections are raised, and some of them are deserving of the most serious consideration. It is urged, with some show of reason, that we must exercise great caution; and as often we are told that we are not justified in drawing conclusions from the action of drugs on the lower animals regarding their action on a human being. It is an acknowledged fact that the vital processes of many animals differ much from those of the human frame, and that numerous substances which exert a powerful action on man have little or no effect on many of the lower animals, and *vice versâ*. Thus, many herbivorous animals luxuriate in, and grow fat on, substances which are most active poisons to human beings; rabbits eat belladonna with impunity, and many of the lowest organisms live on our most powerful poisonous alkaloids. Opium, which in man causes profound sleep, excites in frogs and some other animals violent and fatal convulsions; and one might enumerate a host of similar peculiarities. But though we grant these facts, we are not compelled to regard them as ultimate facts, any more than that the so-called idiosyncrasies observable in human beings are to be accepted as ultimate explanations defying all further analysis. If so, the existence of idiosyncrasies among patients would equally militate against all attempts to generalise as to the action of drugs from the results of clinical experiments. The rational explanation of many of these anomalies, already obtained by patient research, warrants the belief that they may all

ultimately be satisfactorily explained. Already the ascertained relation between the physiological processes of absorption and secretion has thrown much light on many of these facts, and a careful study of the equilibrium of the vital functions in the various classes of animals has cleared up many more. Though a rabbit is not poisoned with belladonna, the drug nevertheless exerts on it the same great physiological action which it produces in man; yet the equilibrium between the circulation and the other great vital functions in the rabbit is such that the disturbing influence which it sets up in man is comparatively little felt. Opium, which throws a frog into convulsions and man into profound sleep, really acts on both organisms in a similar manner. Opium has both a narcotic and convulsive action. In man, with the highly-developed brain, the narcotic action usually predominates, though there are exceptions; in the frog, with the highly-developed spinal system and lowly-differentiated brain, the convulsive action is chiefly manifested. Physiological explanations of numerous similar peculiarities can be offered; and without claiming that physiological research has yet cleared up all the obscurities which surround the subject, the progress that has been made stimulates to further research rather than encourages contented ignorance. No inquirer with any pretence to scientific method would think of transferring the results of experimentation on the lower animals to man, without first ascertaining whether the outward and more evident phenomena, caused by the administration of some drug to one of them, correspond to those following its administration to a human being; or, if such facts were not to be had, he would suspend his judgment as to its action on man, until he might safely ascertain whether such correspondence existed or

not. But, given such similarity, and that can easily be determined, unless the whole fabric of physiology is founded on fallacy, and biology a myth, the establishment of the true physiological action of a drug on one of the lower animals may be accepted with confidence as applicable to man. If, and such things will always occur, too hasty generalisation as to the pathology of diseases, founded on a few questionable physiological or pathological experiments, uncorrected by comparison with the results of careful clinical research, have been made by experimenters, or much more frequently by those less acquainted with all the bearings of the facts; and if from theoretical views as to the essential pathology of some disease or diseases, certain drugs, whose physiological action has been established, are confidently propounded as cures, and are found on trial to be signally ineffective—there are, after all, fewer inconveniences attending this mode of thinking and judging than one may at first sight be inclined to suppose, and certainly fewer than characterise the practice of the pure empiric. The ablest practitioners may be under the influence of erroneous theories as to pathology and therapeutics, and may yet have the prudence to make no dangerous application of them. A careful physician, while he confides in the certain results of accurate experiment, will not go beyond the facts which he has ascertained, and, in his treatment of disease, will never regard them as certain rules of procedure in new and unprecedented cases. His errors, if they exist, will scarcely lead to any bad practical consequences. He will never disregard the facts of trustworthy experience, but endeavour to apply them with reason; and, if his practice should be novel, he will proceed with the caution of a careful scientific inquirer. The errors of the rational

physician who would cautiously confine himself within these limits would be errors only for the persons who might think proper to adopt them after him, and who, not being actuated by the same views, could scarcely be expected to restrict, in a proper manner, the practical application of his principles. For the followers of a sect are always much more inclined than the founders to push systematic opinions to the most absurd extreme. Every recognised failure in the application of the principles of physiological therapeutics will be a step towards the establishment of a more accurate pathology, for the unsuccessful results will serve to show the fallacy of the pathological theory which formed the basis of the treatment. It is most erroneous to suppose, as some do, that those who advocate the cultivation of physiological therapeutics neglect or seek to subvert accurate clinical research and the results of experience. Rather they require it to be, if possible, more rigorous, more exact, and more minute, by directing attention to facts which, to the less educated eye, might seem trivial, but which may be the key to the solution of most important problems. If some have been found who, on the ground of physiological experiments which overthrow the usually accepted theory as to the action of any particular drug, think that they have thereby demolished its claims to use, individuals alone, and not a class or method should be held responsible for such opinions. For when an extended experience has demonstrated the beneficial effect of a certain method of treatment, it would be in the highest degree illogical to conclude that, because the theory on which it is based is proved to be erroneous, therefore the treatment is so also. The most successful treatment may be allied with the most erroneous theory. To illustrate by a much quoted example. Mercury,

usually supposed to be a cholagogue, is found on experiment not to increase the flow of bile. But though not a cholagogue, it is still found in everyday experience to be useful in a certain class of cases where it was supposed to act beneficially by its cholagogue action. In such a case the more philosophical course would be to endeavour to supply a more accurate view as to its real action, than argue against the overwhelming evidence in favour of its employment.

If experimental pharmacologists have sometimes assumed too dictatorial an air, and affected to disregard the teachings of accumulated experience, perhaps faults equally if not more grave might be charged against the so-called "practical men"—a condition of things which shows the necessity that exists for a more thorough union of the physiologist with the physician. Unfortunately, in my opinion, for the interests of practical medicine, the separation between the two has become much greater than is desirable, though much less in this country than in Germany, where the distinction between the practical physician (*pracktischer Arzt*) and the man of science is at its broadest. The cause is no doubt chiefly to be found in the natural tendency to the division of labour; but, while this favours the development of pure science, it does not equally favour the progress of practical medicine. It is certainly not desirable for the interests of physiology and scientific research that all physiologists should be at the same time practical physicians; but, on the other hand, it is eminently desirable that all physicians should have a thorough knowledge of physiology, not only as forming the foundation of all intelligent knowledge and treatment of disease, but as enabling them properly to appreciate the value and practical application of the

results of the labours of those who more especially devote themselves to the experimental solution of pathological and therapeutical problems. In this way we should have less of that tendency, which is so common, to take a part of a truth for the whole, and to found on it generalisations as to the theory of disease and its rational treatment far beyond the facts will bear, and to an extent which the discoverer of the facts himself would in no wise sanction. To such hasty conclusions those rightly object whose experience shows that theoretical notions of this sort and clinical facts are widely at variance. It is sometimes asserted by those who discountenance physiological therapeutics that, notwithstanding all the labours of recent years in this direction, little or nothing has been positively added to our materia medica, and that all our most valuable remedies have been discovered and established by the method of empiricism which the rationalists would decry. It is undoubtedly true that we owe most of our valuable remedies, such as opium, cinchona, &c., to lucky accident, or mere empiricism ; but it is also true, as the history of therapeutics sufficiently shows, that we owe many others, especially those of the mineral world, to chemical and other theories of disease, and that their efficacy has been established by an extensive and hazardous system of experimentation on human beings. But we cannot always wait for lucky accidents, and it is hardly consistent with the duties of our profession to experiment on our patients after the manner of former times. Yet we surely cannot affirm that diseases require no further elucidation, or suppose that every remedy has been discovered, or that we even know the real use and properties of many we already possess. There are many opprobria of medicine which must be

cleared away before we can indulge in self-satisfaction at our skill. Witness those scourges of humanity, cholera, hydrophobia, zymotic diseases, &c., before which we are still utterly powerless. Are we indulging in vain hopes if we look forward with confidence to the day when the discovery of specific remedies will have deprived these scourges of their terrible sting and baneful power? It is at least worthy of our most strenuous efforts to labour for the realisation of such noble aspirations. When we look at the valuable therapeutical agents which have been introduced into medicine, as the result of theoretical considerations deduced from physiological experimentation on the lower animals, within the last few years, as compared with the results of thousands of years of mere empiricism, we have every reason to feel satisfied with the progress which has been made. The great group of the anæsthetics, one of the greatest boons to suffering humanity, and the conditions of their safe administration, owe their chief origin to physiological experimentation on the lower animals; the hydrate of chloral, one of our most valuable and much-used remedies, owes its introduction entirely to this method; the nitrite of amyl, almost a specific for one of the most intense forms of suffering to which man is liable, was deduced from theoretical considerations and physiological experiment; the Calabar bean, and many others which are now deemed indispensable to our armamentarium, are other instances; and besides these new additions to our resources the knowledge we have acquired from physiological experiment regarding the exact action of many drugs already in our possession, has enabled us to extend their use, calculate with exactitude their effects, and prescribe them rationally; while the great facts of physiological

antagonism have enabled us to counteract with the most effectual success many of what in former times were universally fatal poisons. Triumphs such as these may well encourage us to proceed; they not only justify, but, if we have the best interests of humanity at heart, render imperative continued research of the same kind in the future. Yet, in this curious age of general enlightenment and holy pilgrimages, there has been some danger lest the advancement of scientific medicine and with it of the general good, should be discouraged, if not checked, by the outcry of a certain class of people against what they are pleased to term the inhumanity and cruelty of physiological experimentation on the lower animals. It is not my intention, standing here, to make any *apologia vivisectionis*, or to reply to the numerous attacks recently made on its advocates and prosecutors. We may rest content with the approval of those who are capable of appreciating its real bearings and the magnitude of the interests it involves, and leave others to follow. Judging from the style of objections, with which you are all sufficiently well acquainted, I should despair of convincing our opponents, by any arguments I might advance, of the morality of a practice which rests only on a principle which is acted on, and necessarily, in almost every relation of life. But, on the other hand, we who are regarded as offenders have strong reason to feel aggrieved at the practice of those who, professing to have such delicate sensibilities, gratify their prurient propensities by prying into what was never intended for their eyes or ears, and which they have shown themselves incapable of understanding, though eminently capable of misrepresenting, and then vilify in the public prints those

who may be actuated by as high principles of humanity as they who would constitute themselves its only guardians. There is an old proverb which says that certain persons should not see things half done —a proverb particularly applicable to a numerous class of people who, though they can appreciate the practical benefits which have resulted from certain physiological experiments, and therefore admit their justness and necessity, are unable to see the bearing and usefulness of certain others of a similar nature, and would make their own limited capacities a measure of the general scientific intelligence. It has even been asserted by some, as a reason for opposing physiological research, that vivisection has never resulted in any practical good, or been of the slightest service in advancing the interests of medical science. Those who make such assertions proclaim aloud to the world the most valid reasons for paying no further attention to any opinions they may think fit to express on the subject. I trust I have sufficiently shown how the advance of medicine, and therefore the interests of those who require its aid, are inseparably bound up with the science, which is founded almost entirely on experimentation on the lower animals. Those who oppose this line of research ought, in consistency, to refuse to accept the advantages of the enlightened medical practice which can be proved to be the direct result of that which they so much condemn. It is well for themselves that they are compelled to participate in benefits which, in justice, they are not entitled to. It is to be hoped, though we fear with little prospect of immediate realisation, that there soon may be an end to the vexatious opposition which has been made to the progress of scientific research in this country. But, not to pursue

this subject further, I have, in conclusion, gentlemen, only to say that I shall be more than gratified if in this short address I have succeeded in inspiring you with some degree of enthusiasm for the cultivation of the principles of rational medicine.

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