THE GOULSTONIAN LECTURES

ON

PHARMACOLOGY AND ITS RELATION TO THERAPEUTICS.

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THE second error into which medicine has fallen is that, while diseases have been rightly attributed to alterations in the body, it has been supposed to have a composition, and remedial measures to possess powers which were purely imaginary and utterly different from the reality. Returning, again, to our illustration of the child and the box, we may compare the medical doctrines which come under this head to the child acknowledging that it is the lock which keeps the box shut, but fancying it to be composed of butter, iron, and quicksilver, or of little brass thimbles, and believing that the lock will not open because the butter and quicksilver have become wrongly mixed, or the thimbles have been turned upside down. In the various attempts it makes to remedy this condition, it may happen to introduce a key, and thus gain its object; but, if it fail, it may be led to drive a piece of ivory into the keyhole, and will thus attribute the unsuccessful, not to say disastrous, result to its not having used tortoiseshell instead. It may happen to succeed, but its chances are very small, for there are endless possibilities of error. In the history of medicine, we find that similar methods have in some rare instances been successful, but generally they have led to utter failure. Let us shortly run over some examples, beginning with the ancient Greeks, who are said by some to have derived their first philosophical notions from the Phœnicians, and possibly, through them, from the Jews. In the Mosaic cosmogony, we read of the earth, of the waters, and of the Spirit of God which moved upon the face of the waters. From the earth and from the waters, all vegetable and animal life were evolved by the Spirit; and we find a similar triad in the Greek writings, although Stanley may be wrong, and Thales may not have derived his ideas from either Jews or Phœnicians.* Corresponding to these three sources of life, we find three lines of thought, running down almost to the present day. In one, the liquids, in another, the solids, are regarded as of most importance to life and health; and, in the third, both solids and liquids sink into comparative insignificance before the formative power or spirit which acts upon them. Alterations in the fluids of the body were regarded as the causes of disease in the humoral pathology, with which, in later times, the chemical pathology became closely connected. Alterations in the solids took the place of the liquids in the solidist and mechanical schools; and changes in the formative principle, under the various names of nature, pneuma, vital spirit, Archæus, vis medicatrix, etc., were regarded as the essential of disease by the pneumatic school and vitalists. In the writings of Hippocrates, we find the humoral pathology well illustrated, and accompanied by the germ at least of the vitalistic pathology, although Hippocrates seems only to have received them from his predecessors, to have himself been but little influenced by theory, and to have practised chiefly by the light of experience. Adopting the idea of Empedocles, that there are four elements, fire, air, earth, and water, he considers that there are four corresponding qualities, heat, cold, dryness, and moisture, and four corresponding juices or humours, blood, phlegm, yellow bile, and black bile. The heart is the seat of the blood, the brain of the phlegm, the liver of the yellow, and the spleen of the black bile. Besides these, there is a principle pervading and modifying them all, which he calls nature, and which he regards as the healer of diseases. So long as the juices remain in their proper places, and are in due proportion to one another, there is a condition of health; but when they become disproportioned to one another, or leave their proper places, disease is the result. It is curious that the bile, which even in the present day has more sins laid to its charge than any other secretion of the body, was the first to be accused of causing disease. According to Anaxagoras, it left its

proper place, and, passing into the lungs, pleura, and blood-vessels, gave rise to all acute maladies.* The successors of Hippocrates gave less heed than he to the teachings of experience, and allowed themselves to be carried away by theories. Some confined their attention to the fluids as the chief cause of disease, and, teaching their speculations for facts, founded the dogmatic school. Others regarded the formative principle as the most important agent, and from them issued the pneumatic school. This principle or spirit was considered to be something apart from matter, but underlying it, and determining its form and condition. The successors of Hippocrates regarded this principle, which they termed pneuma, as the motor power of the body and identical with the soul. Plato supposed it to come from the air, and assigned certain ways by which it could get to the heart. Erasistratus divided this spirit into two: the psychical soul, *spiritus animalis*, and the vital soul, *spiritus vitalis*. To these, Athenæus, the founder of the so-called pneumatic school, added a third, the physical spirit; and alterations in them he considered to be the causes of disease. These terms are still in daily use; though few of us suspect, when we say that some one is full of or has an excess of animal spirits, that we are using an expression more than fifteen centuries old.

Alterations in the solids of the body were little regarded as causes of disease until the time of Asclepiades, three hundred years after Hippocrates. Following Democritus and Epicurus, he regarded the world as composed of atoms of different sizes, which never came quite close together, but left between them pores of various widths in which finer atoms played freely about, and in the free and unembarrassed movements of which the condition of health consisted. Disease was due either to stoppage of the atoms or to variations in size of the pores. Themison simplified this doctrine by disregarding the atoms, and teaching that diseases depended either on relaxation or contraction of the pores. The simplicity of this doctrine gained it ready acceptance, and led to a method of cure equally simple, the adherents of which formed the methodic school. Diseases depending on contraction of the pores were to be cured by relaxants, and those depending on contraction by astringents. This doctrine also has survived to our own day, and I have heard a Turkish bath regarded as beneficial, and a purgative, as rendering one liable to catch cold, because they opened the pores; the person who employed the phrase seeming to be quite unaware that he was talking not so much of anatomical facts as of the fanciful doctrines of two Greek philosophers promulgated before the Christian era.

Although some physicians held almost exclusively to the doctrines of one school or another, yet the great mass had their opinions influenced by all the schools together, even when they professed to adhere to one. Many of them openly selected from each school what they considered best in it, and, uniting the practices of all, founded another school: that of the eclectics. The opinions of the methodic school were rejected by Galen, but, nevertheless, seem to have affected his pathology. This was, however, chiefly based on the humoral system, and partly on the vitalistic. Like Hippocrates, he attributed most diseases to the four juices of the body, and, like him, used emetics, laxatives, and revulsives to remove the offending humours or change the direction of their current. These revulsives were intended to draw out the offending humours from the body, or at least away from the part of the body into which it was supposed to have wandered and to be doing harm. Purgatives were used for this purpose; but the most powerful revulsive was venesection, the blood being regarded as a more usual cause of disease than the other juices. In spring, its quantity was supposed by Galen to be increased; and it is in all probability to his ideas that we may trace the custom, which prevailed in some parts of this country until a few years ago, of all adults indiscriminately submitting to the loss of several ounces of blood every spring, often by the hands of the farrier or barber. Galen was the last founder of a system of medicine before the fall of the Roman empire; and his doctrines and practice, modified by the mysticism and magic of the Middle Ages, were regarded as of almost Divine authority until about the time of the Reformation. At the end of the fifteenth century, the Turks conferred an inestimable benefit on Europe by taking Constantinople and driving the Greeks to take refuge among the Western races. One of these benefits was that the banished Greeks brought with them the original Greek versions of those ancient medical writings, so much revered by the Westerns, although known to them only through corrupted Latin versions.† On comparing these translations, previously so venerated, with the originals, many discrepancies were discovered; and men were thus led to doubt the correctness of the statements made in either the originals or the copies, and to appeal to nature to settle the dispute. The most noted opponent of the Galenical doctrines was Paracelsus, who, in the

* Stanley, *History of Philosophy*, folio edition, page 5.* Sprengel, *op. cit.*, vol. i, sect. iii, page 33.† Wunderlich, *Geschichte der Medicin*, p. 62.

course of a wandering life, had consorted with alchemists, miners and metal-workers, fortune-tellers, wise women, and all sorts of curious characters, and had learned from them such secrets as they possessed. In his writings, we seem to meet again the doctrines of the early Greeks, modified by the influence of his strange associates. In place of the fire, air, earth, and water, with the underlying formative principle or nature of Hippocrates, Paracelsus puts sulphur, salts, and mercury,* with a vital spirit which governs them. Sulphur seems to correspond to the fire and air, salts to the earth, and mercury (which dissolves metals) to the water. This vital spirit pervaded the whole body, but had a special action in every part: heart, liver, brain, lungs, and kidneys. When it was cut off from any part, that part died; and whenever it was weak, it required to be strengthened. His manner of strengthening it in the heart was very sensible, and likely to prove both useful and agreeable to his patients; for he first made an essence of crocus with pure spirit, and then administered one drop of this in good wine to old persons and to those who were melancholic or suffering from low spirits.† In his writings, we find both a chemical and spiritual element; and these formed the points of departure for two schools, just as the humoral and spiritual elements in the pathology of Hippocrates formed the points of departure of the dogmatic and pneumatic schools of the ancients. Both the chemical and spiritual notions of Paracelsus were developed by his follower Van Helmont, who converted his *spiritus vite* into a moral spirit, which he named Archæus, and which built up the body out of other materials. Instead of pervading the whole body, like the *spiritus vite*, the Archæus had his seat in the stomach, and ruled over a number of smaller Archæi, which he sent to different parts of the body to do his bidding. He was of a very uncertain temper, sometimes angry, sometimes depressed, and sometimes heedless. Paracelsus regarded fermentation, or, as he termed it, putrefaction, as an essential element in the generation of new beings, as well as in the digestion of food. According to Van Helmont, it was by means of a ferment that Archæus built up the body out of other materials; and epilepsy and mania were caused by his sending acid ferments out of the stomach into other parts, without thinking what he was doing. It is the Archæus, rather than the ferment, which plays the chief part in Van Helmont's pathology; and it is this spiritual side of it which is chiefly developed in the doctrines of Stahl, in whose writings the *spiritus vite* and the Archæus are replaced by the *anima* or soul, which he regards as the essential part of a man, the body being merely the organ through which it acts. The soul builds up the body, causes its different parts to act in harmony, and keeps it alive by preventing the putrefaction from taking place to which the body is constantly liable, and which occurs whenever the soul leaves it. The chemical element in the pathology of Van Helmont was much more generally accepted than the spiritual. One of its greatest followers was Sylvius dele Boë, according to whom fermentation is the basis of life, and of all its functions. The chief products of this fermentation are acids and alkalies. Diseases are produced by the predominance of one of these over the other; and are to be treated by neutralising the faulty humour with acids or alkalies, according to the requirements of the case, by expelling it by evacuations, especially diaphoretics, and by correcting the morbid process of fermentation by means of alteratives. This theory of fermentation found a strong supporter in Willis, who introduced the notion that it was influenced by the nervous system—a notion which seems to express the real meaning of Stahl, who lived long afterwards, but had not Willis's clear insight. The chemical system was displaced for a time by others; but recent researches show that many of the processes of life are really carried on by means of ferments, and that, if our present knowledge do not yet justify us in saying that life is fermentation, yet such a statement would contain much truth. The system which, for a while, cast the chemical into the background, was the mechanical one which was founded by Asclepiades and Themison, but having been rejected by Galen, had few or no adherents during the Middle Ages. It was again revived in another form by Borelli, who discarded the atoms, but retained the pores, and attributed disease to stoppage of the openings of the nerves in the skin and glands by a glutinous matter, so that the nervous juices were retained. In consequence of this, they underwent fermentation, irritated the nerves and heart, and caused fever. Alterations in the solids of the body were also regarded as causes of disease, and his treatment consisted in opening the pores by diaphoretics and strengthening the solids by quinine. Baglivi paid little attention to the juices, and regarded diseases as depending only on relaxation and tension of the solids. The celebrated Dutch physician Boerhaave

combined the humoral and solidist pathology, and regarded changes in the circulation, produced by alterations in the solids, as the causes of disease. The mechanical notions regarding rigidity and relaxation of the fibres became modified by Haller's demonstration of the irritability and inherent contractile power of muscular fibre, apart from the nervous system, but influenced by it; and Hoffman, consequently, divided diseases into those due to spasm and those due to atony. A great advance was made by Brown, who recognised the vital functions as the result of reaction against stimuli, and divided diseases into sthenic and asthenic, according as the reaction was defective or excessive. His doctrines were adopted and somewhat modified by Rasori, who replaced the terms sthenic and asthenic by *diathesis de stimulo* and *diathesis de contra-stimulo*. These were not to be recognised entirely by symptoms, but by the reaction of the body to certain drugs, and especially to venesection. If venesection did good, the disease belonged to the *diathesis de stimulo*; if not, to the other. The excessive or defective reaction, which Brown regarded as a character of the whole body, was limited by Broussais to parts, and stimulants were considered by him to have a different action according as they were applied to the part affected or another. In the first case, they were stimulants; in the second, revulsives. Brown regarded the asthenic as the common type of disease; but Rasori and Broussais took the other side, and contra-stimulants (such as large doses of tartar-emetic and bleeding) were their favourite remedies—remedies so destructive that it has been computed that Brown's doctrines have, through the hands of his followers, directly or indirectly, cost more lives than the French Revolution.

From this short account of the history of medical doctrines and precepts, it will be seen why, at the outset of my lecture, I dwelt upon the child's pastime of "making believe", as in some senses an illustration of medical science in the ancient and the mediæval times—why, in fact, an illustration so simple and trivial might apply to the whole practice of medicine, even to a period as recent as the earlier decades of the eighteenth century. The simplicity of the child's speculations about the construction of a lock may show us the nature of some of those precepts of Galen, which, for centuries, were regarded with blind obedience, and as an authority almost Divine on questions of medical practice. Even yet, we are not free from an influence, which is worthy of respect and inquiry only because it takes us back to those earlier times of poetry and fable. We may still occasionally hear, from members of our own profession, that such a remedy "will cleanse the blood", that another will "open the pores", forgetting that they are repeating the long-discarded theories of Hippocrates and Themison. We all of us speak of laxatives and astringents, of sedatives and tonics, and alteratives, without knowing always what we mean. If we were summoned to explain the exact tissue, or organ, or process we proposed to alter by our alteratives, or the exact cell or fibre we proposed to strengthen by our tonics, we might be sorely puzzled for a true answer. But these old notions are gradually disappearing. The vagueness of the former times gives place to a sure and scientific grasp of our calling and its duties. We begin to localise and determine the parts upon which our remedies are to act. We approach to a clear idea of what we wish medicine to do. But we are still in the earliest stages of what, I trust, will soon be one of the ripest and most advanced, as it is one of the most beneficent, domains of modern science. Our ideas are often hazy and indefinite. We give medicine at random, with no defined idea of what it should do, and trusting to chance for a good result. When a remedy fails in its work, we can give no reason for the failure. We do not even seek out a reason, but content ourselves with saying "Oh, it did not act as it usually does". We forget that there must be some reason for this; that there are reasons for failure as well as for success. This law pervades the universe, and we cannot escape it in the dominion of medicine. If a stone do not fall to the ground, it is because gravity is prevented from drawing it to the earth. We seek out the cause, we remove the agent that arrests a law of nature, and down the stone must fall. We know that it will fall with a certain velocity; that it will exert a certain force. We know that this velocity will not vary the millionth part of a second, that this force will not lose the minutest fraction of a foot-pound, unless some other force interferes and interrupts it. Now, why should a law, which is so manifest to all the world, which is seen in the wonderful scenery of the earth, and whose powers we can gauge with an accuracy so minute and unerring, why should the law which governs the falling of a stone be better known to science than the laws which govern us in dealing with life and growth, sickness and health? It is in endeavouring to answer this question that we may hope to bring medical science into as advanced a position as other sciences. An ounce of sulphate of magnesia, dissolved in half a pint of water, will precipitate a solution of baryta, and will give us a definite quantity of

* Paracelsus, *De quinque Entibus omnium Morborum*. Tom. i. p. 64. Francfurt, 1563.
† *Drey herrliche Schriftlein Herrgen Doctors Theophrasti von Hohenheim. Von Kraft der aussen Gledern*. Das dritte Buch, das andere Capitel. Basel, Samuel Apiario, 1572.

the sulphate of baryta. This result we can count upon with infallible certainty. Given as a purgative, we cannot be sure of its action, although its power should be as certain and definite in the human frame as in the test-tube. The reason that we cannot be sure of its action as a remedy is because of differences in the conditions under which it is acting. It is our business to find out these conditions, so that, when we meet them again, we may know how to meet them. For there is an invariable relation between cause and effect, as invariable as the relation between an unchecked falling stone and the earth. We are, as I have said, just learning in medicine the paramount importance of tracing effects to their true cause. We may laugh at the credulity of the Middle Ages; when the way to cure a sword-wound was to apply a salve to the sword; when the only reason for the pestilence was the eccentric advent of some wandering fiery comet. But it is only with our own day that we improve upon the knowledge of our fathers; that, disdaining witchcraft, and spells, and delusions, and charms, and fables, we begin to see that the laws under which our bodies live are as immutable as the laws which govern Jupiter and the Pleiades; that, when we break them, we must suffer the penalty; that every infraction has its penalty. We learn that there is no such thing as an effect without a cause; we learn, too, that the penalty for breaking one law will not attend the violation of another. It would be absurd to say that if a child killed a fly it would have a pain in the stomach, and yet the time has been when such a statement would have been logical according to the accepted logic of medicine. The child may kill a fly—the child may have a pain in the stomach; but the pain does not result from the deed. The deed may lead to the pain in this, that the child may have to go dinnerless as a punishment for cruelty, and may gorge itself with green apples to supply nature's needs. But the penalty would be for eating unripe fruit, not for killing flies. In the same way, an unrighteous community given to cheating, lying, and profane speech may be visited by an epidemic. But the epidemic would come, not as the penalty for broken scriptural commandments, but as the penalty for broken sanitary laws, the penalty for impure water, imperfect drainage, or communication with an infected district. The violation of scriptural laws may lead to buildings being scamped, to imperfect drains, and a polluted water-supply. But simple repentance for these sins will not stop the epidemic until the sanitary laws are observed. The laws of nature admit of no exception and no excuse. The rain falls alike on the just and the unjust. If a viaduct break and a train be thrown into the river or the valley, the good and the bad alike suffer. Good and bad alike suffer, because, whatever respect they may have shown to moral laws, in this case they have offended the law of gravity—a law which exacts their lives or their limbs as its penalty. If a man swallow poison, the poison will do its work, whether the act of taking was a conscious or an unconscious act. This knowledge has enabled us to avert danger from ourselves and from those who, like children, would, in their ignorance, swallow the bright and tempting berry merely because it was pleasing to the eye, unconscious of the deadly principles lurking in its core. It is only within a short time that we have learned that men may become dull, listless, unable to command their faculties, because of the poisonous fumes from a fireplace or a stove, or the impalpable powder that floats from the arsenical paper decorating the walls. We know that the green tracery which scatters garlands and vines over our modern walls may be as death-dealing, because of this unseen arsenical presence, as the fumes of carbonic acid gas. We know that a whole district may fall under the terrible scourge of typhoid fever because the water-supply has found some contamination. We know that dinner-guests may be affected by scarlet fever because of ices composed of milk which contained the virus of that disease.* The laws of nature are independent of our fancies. We must conform to them, or suffer the penalty of disobedience and neglect. Ignorance will not prevent disease. A physician's fancies as to the cause of a disease, or the nature of a remedy, will not check it. It is only by knowing as a truth, by patient study and investigation, the exact causes of disease, that we can avoid it. It is only by knowing these causes, the value of the remedies which will affect them, and the conditions of the human frame under which these remedies can have their full influence, that we can effect a cure. How this is to be done, is the subject to which I propose to address myself in the next lecture.

* Buchanan. Mr. Simon's *Public Health Report* for 1875.

AMONG those who passed the recent Cambridge Local Examinations with honours was a lad named Farrar, who is deaf and dumb. He is under sixteen years of age, and has obtained a certificate for classics and mathematics. This is probably the first case of the sort in the United Kingdom.

THE DIAGNOSIS AND TREATMENT OF AUDITORY-NERVE VERTIGO.*

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THE form of vertigo which depends on a morbid state of the organ of hearing, and has been variously termed "auditory vertigo", "labyrinthine vertigo", or, from the name of the aural surgeon who first called attention to its more striking characters, "Menière's vertigo" or "Menière's disease", has passed, to some extent, from the province of special aural surgery into that of general medicine. The reason is not far to seek. The symptom vertigo has usually little or no apparent connection with its actual cause. Hence its origin is constantly unsuspected by the sufferer. Moreover, there exists frequently an obtrusive association between this giddiness and certain gastric symptoms, which has constantly been and is still frequently misconstrued, and the nature of the disease consequently misconceived by both the patient and his medical adviser. The object of this paper is to illustrate these associations, which so obscure the real relations of the symptom, and to consider the points which are of chief importance in its diagnosis and in its treatment.

It is not necessary here to do more than allude to the evidence on which the pathology of the disease is based. That evidence is of three kinds: first, the frequent association of paroxysmal vertigo with defect or disturbance of the function of the internal ear or auditory nerve; secondly, on some scanty pathological facts, which point to the existence in these cases of a morbid state of the semicircular canals; and, lastly, on the well known experimental evidence of the connection between the function of the semicircular canals and the maintenance of the equilibrium of the body.† The theory of their function is, that they give information of the position of the head to a coordinating centre which presides over the equilibrium of the body, and which experimental physiology has located in the cerebellum. Into the question of the mechanism of the action and disturbance of the semicircular canals it is not necessary here to enter. Although the theory of varying pressure of the endolymph originated by Goltz, and rendered more precise by later writers, appears highly probable, its application to the details of the normal action of the canals is still surrounded by uncertainties which render it difficult to frame a satisfactory detailed explanation of the phenomena of this disease.‡

All that we can conclude is, that their morbid condition causes a morbid action of the centre of equilibration, which may so disturb the equilibrium of the body as to throw the sufferer to the ground, or may merely result in a sense of corresponding movement or of mere instability. It is important, for a clear comprehension of the symptoms of these cases, to remember that the sense of movement and an actual movement, subjective vertigo and actual rotation or falling, are aspects of the same process. It is the motor tendency to turn which is felt as subjective vertigo. This was pointed out long ago by Dr. Reynolds,§ and its significance has been insisted upon from many points of view by Dr. Hughlings Jackson.||

Whether any impression from the semicircular canals enters into the total sensation is uncertain, but that the chief part of the feeling of vertigo, that of movement in the individual or in external objects, is the sensation of an "incipient motor process", is evident from the fact

* A portion of this paper was read before the meeting of the British Medical Association at Sheffield, August 1876.

† An abstract of the facts, with references to the chief sources of information, has been given by Dr. Hughlings Jackson (*Medical Times and Gazette*, August 17th, 1874, and *London Medical Record*, 1874, pp. 238 and 254). The experimental evidence has been fully described and discussed by Dr. Ferrier (*Functions of the Brain*, p. 69, and *West Riding Asylum Reports*, vol. v).

‡ Assuming the theory of Mach, Breuer, and Crum-Brown to be correct, that the variation in the pressure of the endolymph in the ampullæ of the several canals, produced by the movements of the head, constitutes the means of their stimulation, it is reasonable to suppose that the equilibrium centre is influenced by *minus* as well as by *plus* variations in the pressure of the endolymph in the ampullæ. The excitation of the several ampullary nerves in various movements will therefore be a very complex matter, involving probably the mutual action of several canals, just as the guiding information as to the position of the eyeball, by which the equilibrium centre is also influenced, depends on the degree of contraction of several muscles, oblique and straight. It must be remembered, also, that the free communication between the canals will increase the complexity of their mutual relations.

§ "Generally, in man, the tendency to movement is arrested by an effort of the will *per se*, or by grasping some object for support. The sensation of its production remains, and is projected onwards into the objects of the material world" (*On Vertigo*, 1854, p. 41).

|| "Giddiness is objectively a motor symptom, and the 'sensation' that is attended by is a state of consciousness accompanying the outgoing current" (*Clinical and Physiological Researches on the Nervous System*, Preface, p. xxv; see also *Medical Press and Circular*, December 2nd, 1874, p. 477).