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LECTURES

ON

MATERIA MEDICA, OR PHARMACOLOGY, AND GENERAL THERAPEUTICS,

Delivered at the Aldersgate School of Medicine,

By Jon. Pereira, Esq., F.L.S.

Introductory Lecture.

Gentlemen,—If we compare the two kingdoms of nature, the organized and the mineral, we can scarcely fail being struck with one very remarkable distinction—namely, that the first has what may be called two modes of existence, the one termed *health*, which I shall take the liberty of designating the *normal* condition; the other denominated *disease*, which, by way of contrast, we may regard as an *abnormal* state. Each of these conditions has a science appropriated to itself; physiology treats of organized beings in the healthy state, while pathology is devoted to the condition of disease. Among minerals, however, we find no existence analogous to that of disease, nor any science corresponding to that of pathology; their active properties never vary either in degree or kind, and therefore their phenomena can be anticipated and calculated. Among living beings, on the other hand, we find, as the illustrious Bichat has remarked, that the functions are subject to numberless varieties, frequently exceeding their natural degree, and baffling all calculation. We cannot foresee or foretell their phenomena: we judge only by analogy, which in the vast proportion of instances is extremely uncertain.

The existence of all living beings, whether we regard them in their normal or their abnormal states, is limited; and therefore death is common to both conditions—"*Fugienda nunquam est mors.*" But as the latter of these two states, namely disease, has a tendency to shorten this limited existence, and as it is generally accompanied with more or less pain, we almost instinctively seek some means of restoring health, and thereby of preserving our lives, and alleviating our sufferings. These means, whatever may be their nature, have been denominated *remedies*, or therapeutic agents; and that branch of the science of medicine which treats of them has been called *acology*.

They include those which may be denominated *hygienic*, as aliment, bodily exercise, mental impressions, and other agents, which were formerly very absurdly termed the non-naturals; 2dly, *surgical* remedies, as bloodletting, acupuncture, &c. 3dly, certain *physical* agents, as heat and electricity; and 4thly, *pharmacological* agents, or *medicines*, and which we may define to be those substances used in the treatment of diseases, which, when applied to the body, produce certain alterations or modifications in the functions, and which are not essentially alimentary.

The present course of lectures is devoted to the last class, and will contain an account of the natural history, the physical and chemical properties, and the physiological effects and uses, of medicines. I should prefer announcing the course simply as one on *Pharmacology;* but, in conformity with the regulations of the examining boards, I am obliged to employ the term *Materia Medica*, which is so far objectionable, that writers are not agreed on its limits, its uses, or its applications.

History.—It is customary to devote a portion of the introductory lecture to an historical outline. I may remark, however, that in the short space of a single lecture it is impossible to offer more than a very rudimentary sketch. I am of opinion also, that it is much better, and far more interesting, to study the history of a science when we have made ourselves acquainted with most of its details; so that, in fact,

any historical discussion would be more appropriate at the conclusion than at the commencement of a course.

With this impression I have thought it best to put a few of the leading particulars relating to pharmacology into a tabular form, to which each of you can refer at your leisure. [See p. 10.]

In justice I ought to add, that I have received considerable assistance in the arrangement of this table from Dr. Choulant's *Tafeln zur Geschichte der Medizin.* Those who desire to enter more fully into the subject may consult the posthumous work of Dr. Voigtels, entitled, *Vollständiges System der Arzneimittellehre*, and also Dr. Bischoff's *Handbuch der Arzneimittellehre.* We are remarkably deficient in writings in our language on this subject; and, indeed, the only book to which I can refer you, is the *Treatise of Materia Medica*, by Dr. Cullen, in which you will find a brief critical survey of the history of this branch of medical science. As pharmacology forms a part of the science of medicine, you may refer with advantage to writings on the history of medicine in general. Sprengel's work on this subject is the most elaborate and complete yet published. As an introduction, I would strongly recommend to your notice the admirable *Sketch of the History of Medicine*, by Dr. Bostock.

Means of learning the effects of medicines.—Leaving, therefore, historical details, I proceed to examine the different means we may adopt to acquire a knowledge of the effects of medicines. I may premise, that the statements made by the ancient writers on this subject are not to be relied on, for in some cases they are totally devoid of truth, and in others much overcharged. This is particularly remarkable in the writings of Dioscorides and Galen.

The doctrines of *astral influences*, and of *signatures*, adopted by Paracelsus, are too absurd to require much notice. They form part of a supposed hidden science of divine mysteries, called *cabala.* On account of their resemblance to the testicles, the bulbs of some orchideous plants were supposed to act on the organs of generation; while the fancied resemblance between the leaves of the *Pulmonaria* and the lungs of man was thought to indicate the the use of this plant in pulmonary affections.

Discarding all absurd notions of this kind, we have *four* principal methods which in modern times have been resorted to, for the purpose of ascertaining the effects of medicines. These are founded—

1. On the sensible properties of medicines.
2. On their natural-historical properties.
3. On their chemical properties.
4. On the experience of their effects.

1. The *sensible properties*, such as colour, taste, and smell, have long been used. We are, in fact, led instinctively to this mode of investigation. The lower animals evidently derive considerable assistance in judging of the qualities of their food by the organs of their senses. We find them for the most part avoiding poisonous substances, selecting such as are wholesome and nutritious, and when sick, frequently resorting to such herbs as are best adapted to assist in restoring health.

There are two important objections to this mode of estimating the properties of medicines: the first is the difficulty, if not absolute impossibility, of defining sensations; for supposing a new substance should be discovered, whose taste is remarkable and peculiar, how is it possible to convey by words to a second person a correct notion of the kind of impression made on the gustatory organ? Secondly, the idiosyncrasies of sensation are so extraordinary, that two persons may disagree as to the character of the sensible property; for a sensation which may be grateful and pleasing to one, may be disagreeable and loathsome to another.

This mode of judging of the virtues of medicines has been confined principally to vegetable substances; but even here cannot be relied on. Both *Quinia* and *Strychnia* are devoid of smell, are white, and have an intensely bitter taste, and yet, notwithstanding this agreement in their sensible properties, differ widely in their effects, the one being a tonic, the other a powerful poison.

2. *Natural-historical properties* are those made use of in natural history to determine the affinities of natural bodies; they comprehend exterior form, and structure. They have been resorted to for the purpose of determining the effects of certain substances. It has long been supposed that those plants which resemble each other in their external appearances are endowed with analogous medicinal properties. Cæsalpinus was, I believe, the first who taught this doctrine. Baptista Porta says, "*tali formæ tales vires conveniunt;*" and Linnæus also remarks, "*Plantæ quæ* genere *conveniunt, etiam virtute conveniunt; quæ* ordine *naturali continentur, etiam virtute propius accedunt; quæque* classe *naturali congruunt, etiam viribus quodammodo congruunt.*" The first distinct work on the subject is that by Decandolle, entitled, *Essai sur les Propriétés Médicales des Plantes*, the first edition of which appeared in 1804. In the year 1831 we had another interesting treatise on the same subject by Dierbach, entitled, *Abhandlung über die Arzneikräfte des Planzen, vergleichen mit ihrer Structur und ihren chemischen Bestandtheilen.*

It is undeniable that in numerous instances there exists an analogy between

the exterior forms and the medicinal properties of plants, so that we can sometimes predict the active principle and mode of operation, merely by knowing to what part of a natural arrangement a plant properly belongs. Cruciferæ (fig. 1), for example, present the greatest uniformity in their botanical, chemical, and medicinal characters. They contain a volatile acrid principle, which renders them stimulant; and having been employed successfully in scurvy, are frequently termed anti-scorbutics. The Labiatæ (fig. 2),

FIG. 1.—*Raphanus sativus.*

FIG. 2.—*Glechoma hederacea.*

which constitute, perhaps, the most natural family of the whole vegetable kingdom, contain a bitter resinous, or extractive matter, and an etherial, aromatic, or volatile oil; which two principles, mixed in different proportions, are found in all the species, to which they communicate tonic and carminative properties. Neither Cruciferæ nor Labiatæ contain a single unwholesome or even suspicious species. In Coniferæ (fig. 3) we find the different species pervaded with an oleo-resinous juice, in consequence of which they possess stimulant properties.

FIG. 3.—*Picea vulgaris.*

We are obliged, however, to admit the existence of numerous exceptions to the before-mentioned general rule. We can point out many families, the plants of which appear to possess the greatest botanical affinity for each other, but whose remedial properties are very different. Take Umbelliferæ (fig. 4) as an example. The root and leaves of the *Daucus carota* are wholesome and nutritive, but the analogous parts of *Conium maculatum* are highly poisonous. In some cases we even find plants of the same genus differing considerably from each other in a medicinal point of view. I need only mention as examples in proof, *Cucumis melo* and *Cucumis colocynthis.* If

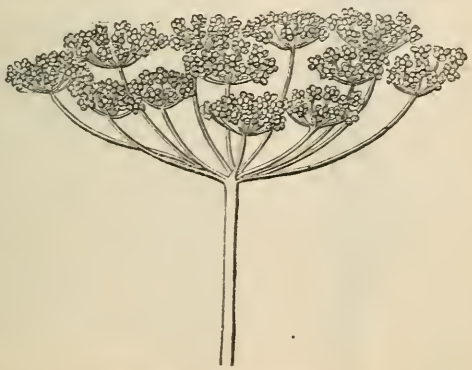

FIG. 4.—*Fœniculum vulgare.*

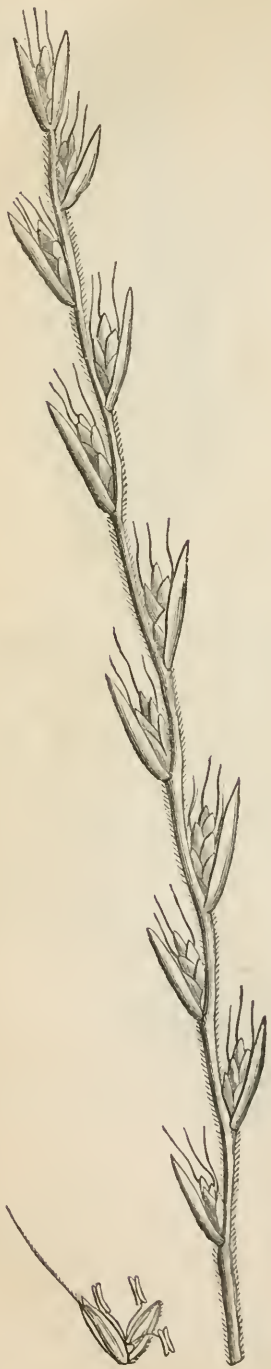

Fig. 5.—*Lolium temulentum.*

we are to believe the statements of competent authorities, even Gramineæ, which Decandolle declares to be "la famille la plus naturelle," contains more than one exception to the general statement in question. For the most part the plants of this family are farinaceous and nutritive. "None," says Dr. Lindley, "are unwholesome in their natural state, with the single exception of *Lolium temulentum* (fig. 5), a common weed in many parts of England, the effects of which are undoubtedly deleterious, although perhaps much exaggerated." I may remark, however, that several other grasses have been asserted to be unwholesome. Loudon tells us that the seeds of *Bromus mollis* are said to bring on giddiness in the human species and quadrupeds, and to be fatal to poultry. The root of *Bromus purgans* is said to be used in Canada as an emetic, in doses of forty grains; but I confess the authority for this statement is somewhat doubtful. *Bromus catharticus*, a Chilian plant, has a thick root, which acts as a purgative. I am aware that these statements require further proof, for *Bromus secalinus*, which was stated by some writers also to be poisonous, has been found by Cordier to be innocuous. We have, however, another case, on much better authority (that of Humboldt);—I allude now to a Peruvian grass, called by Kunth the *Festuca quadridentata* (fig. 6), and which is denominated in Sprengel's *Species Plantarum* the *Sessleria quitensis*. Humboldt tells us that this plant is very poisonous, and even fatal to animals. Perhaps this may be the grass described by some under the name of *Carapoucha*, and which, by others, has been called *Carapullo*. Frezier, in his *Voyage to the South Sea and along the Coasts of Chili and Peru*, in the years 1712, 1713, and 1714, says, in speaking of Lima, "There is an herb called *Carapullo*, which grows like a tuft of grass, and yields an ear, the decoction of which makes such as drink it delirious for some days. The Indians make use of it to discover the natural disposition of their children. All the time when it has its operation, they place by them the tools of all such trades as they may follow,—as by a maiden, a spindle, wool, scissars, cloth, kitchen furniture, &c.; and by a youth, accoutrements for a horse, awls, hammers, &c.: and that tool they take most fancy to in their delirium, is a certain indication of the trade they are fittest for,—as I was assured by a French surgeon, who was an eye-witness of this verity."

In the family *Solaneæ* we meet with other exceptions. Compare, for example, the fruits of *Capsicum annuum* and *Atropa Belladonnæ*. I might select many other instances (especially from the family *Leguminosæ*), to the same effect, but I shall content myself with the examples already

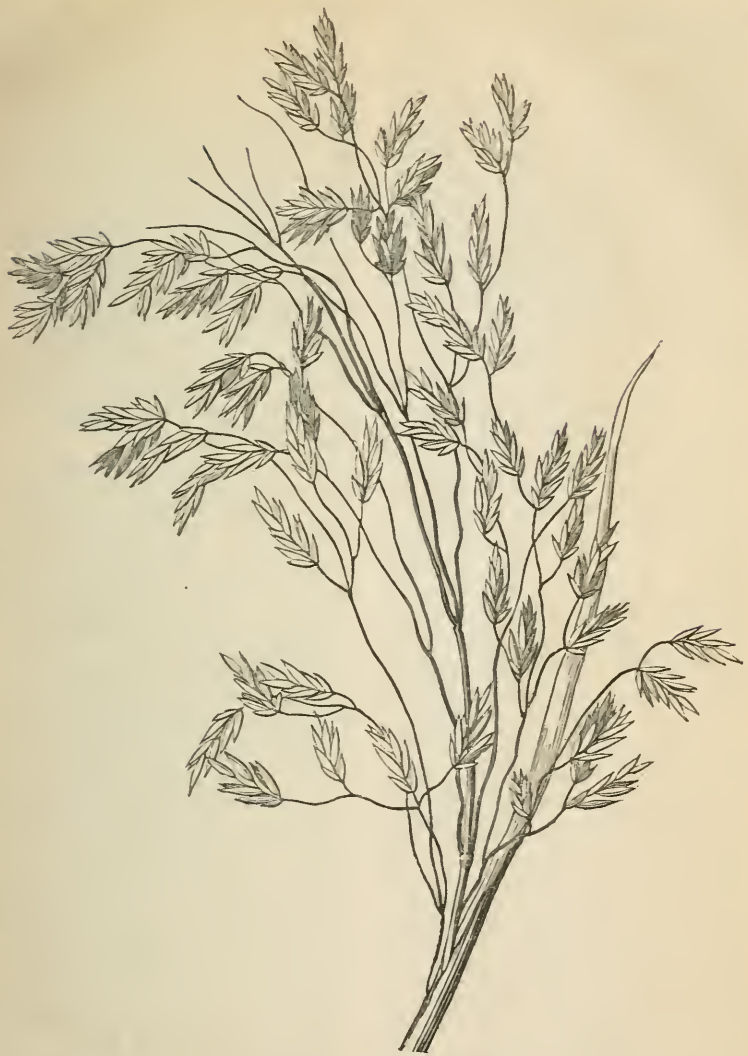

Fig. 6.—*Festuca quadridentata.*

adduced, as sufficiently warranting the assertion that, in the present state of science, botanical affinities cannot be confidently relied on by the medical practitioner for determining the effects of remedial agents. I cannot, therefore, agree with Dr. Lindley, in his assertion, that "a knowledge of one plant is a guide to the practitioner, which enables him to substitute some other plant *with confidence* which is naturally allied to it." In drawing this conclusion, I must caution you against running into an opposite extreme, and assuming that botanical affinities are of no use whatever to the medical practitioner. It will be my duty, when I speak of the vegetable materia medica, to shew you that as a *general rule* we may admit that plants of the same family agree in the *nature* of their medicinal operation, but that this general rule has many remarkable exceptions which diminish its utility in practice, though they do not absolutely destroy it. Doubtless in some

cases the apparent exceptions arise from our imperfect knowledge of the affinities of plants.

No one has even attempted to infer the medicinal properties either of minerals or of animals from their natural-historical qualities. In the mineral kingdom, it has of late been shewn that two different substances may assume the same form; and that this depends not on a similarity in the *nature* but of the *number* of the molecules entering into the constitution of the substances. Such substances are said to be *isomorphous*. This fact proves that there is no necessary relation between the exterior forms and medicinal properties of minerals.

3. The *chemical properties* of medicines have sometimes been resorted to for the purpose of determining their medicinal properties. That this mode of investigation is fallacious, is, I think, demonstrated from the following circumstances:—

(*a*). Substances whose chemical properties are exceedingly dissimilar, sometimes concur in the nature of their medicinal effects; and as examples of this, I may mention manna and supertartrate of potash.

(*b*). Similarity of chemical properties is not always attended with a similarity of medicinal effect. *Baryta* and *Strontia*, for example, agree in so many chemical characters, that they were at first confounded; yet the salts of the first of these substances are energetic poisons, while those of the latter act feebly on the body.

(*c*). We cannot determine the operation of medicines by knowing either the nature or number of the ultimate particles. Who could have anticipated that a compound of carbon, nitrogen, and hydrogen (all inert substances) could possess such an energetic operation as that of *hydrocyanic acid*? *Carbonic* and *oxalic* acids are composed of the same kind of constituents the one as the other, but in somewhat different proportions; yet in how opposite a manner do these substances act when taken into the stomach! Compare the per centage composition of *Quinia*, *Strychnia*, and *Morphia*, and the slight differences in composition will not be found sufficient to explain their dissimilar operation.

	Quinia.	Morphia.	Strychnia.
Carbon ..	75·76	72·20	77·21
Hydrogen .	7·52	6·24	6·73
Nitrogen ..	8·11	4·92	5·96
Oxygen ..	8·61	16·66	10·10
	100·00	100·02	100·00

(*d*). But it may be said we ought to take proximate and not ultimate principles as our guide. To this I reply, we cannot always determine what are *products* and what *educts*, in our analysis of organic substances, and therefore we cannot tell precisely what are and what are not proximate principles. It was at one time supposed that the essential oil of bitter almonds was contained in the seeds from whence it is obtained. It is now well established that this oil, as well as the hydrocyanic acid it contains, are formed by the action of the water (employed in the process) on the almond cake. The same statement may be applied to the volatile oil of mustard-seed. If, then, this really happen in two cases, we may fairly suspect it in many others. Raspail regards the vegetable alkalies (such as quinia, cinchonia, morphia, &c.) as artificial products; but the balance of evidence is certainly against this notion.

(*e*). In some instances the active principle of a medicine is much more difficult to isolate than to discover the nature of the operation of the agent by other means. Ergot of rye is a good example of this. We have yet no satisfactory results from chemical investigations as to the nature and properties of the active principle of this substance.

(*f*). Lastly, it appears that two substances may be composed of the same constituents, and in the same ratio, and yet be endowed with different properties. Such substances are said to be *isomeric*.

4. *Experiment on man and other animals* constitutes the last and most important method of ascertaining the virtues of medicines; for I think I have made it sufficiently evident that for this purpose we cannot implicitly confide in the sensible, natural-historical, or chemical properties. The action of medicines and poisons on man is for the most part similar in kind or quality, though different in degree, to that on other animals,—modified somewhat by the variations in the development of the several organs and functions. It has been asserted that some substances which are energetic poisons to man are innocuous to animals, and *vice versâ*. Let me caution you against implicitly believing vague assertions of this kind. Thus Voigtels states that horses may eat *Aconitum napellus* with impunity; but Viborg has shewn that they, like man, are poisoned by it, though the quantity requisite to produce death is large. It is a popular notion that arsenious acid is innocuous to horses. I am told that doses of a scruple, or even half a drachm, are frequently exhibited to them, with no evidently hurtful consequences; nay, it is said with beneficial re-

sults. But notwithstanding these statements, we are quite certain that arsenious acid acts as a poison to the horse. In the year 1812, a man of the name of Dawson was indicted for poisoning several horses at Newmarket, by injecting an arsenical solution with a syringe into the watering-troughs. Mr. Bowles, a veterinary surgeon, in his evidence, mentioned that he had poisoned horses by way of experiment, and had found, after death, extensive inflammation of the stomach and intestines. The prisoner was condemned, and executed.

Let me not be misunderstood. I do not deny the diversity of action of poisons and medicines on different animals, but I decidedly agree in opinion with Dr. Christison, that "if the subject is studied more deeply, the greater number of the alleged diversities will prove rather apparent than real."

One objection to experiment on animals as a means of learning the operation of medicines, is that we can obtain little or no information respecting the peculiar influence which certain substances exercise in particular diseases. The beneficial effects of cinchona bark in agues could hardly have been discovered by comparative experiments, though the reverse has been asserted, as I shall hereafter notice.

A very important circumstance to bear in mind, in experiments on any animals, is that the effects of the same medicine vary with the part of the body to which it may be applied; for example, carbonic acid acts as a deadly poison when introduced into the lungs, whereas, taken into the stomach, it operates as an agreeable excitant. The volatile stimulants act more powerfully on the system when taken into the stomach, than when applied to the rectum.

In ascertaining the operation of remedial agents on man, it is necessary that we examine their influence in the two modes of existence—health and disease. A reliance on either solely may lead to most erroneous inferences. The beneficial influence of arsenious acid in agues, or in lepra, could never have been anticipated by any experiments made with this substance in health; nor could we form a correct notion of the effects and proper doses of opium by employing it in tetanus, nor by using mercurials in fever.

Thus, then, it appears, that although we may draw some general inferences as to the operation of medicines by the examination of their sensible, natural-historical, or chemical properties, yet the information thus gained is not sufficiently precise to be of much practical utility; and we are therefore necessitated to resort to careful observation of the effects on man and other animals, in order to arrive at accurate conclusions.

Cause of the effects of medicines.—Before I proceed to examine the nature of the effects produced by the action of medicines on the body, I think it expedient to bring before you some theoretical, or perhaps I ought to call them hypothetical, details, connected with our subject. Linnæus adopts as a canon a remark of Hoffman, that "*Duo in medicina fulcra sunt, ratio et experientia; experientia præcedit, ratio sequitur; hinc rationes in rebus medicis experientia non conditæ, nihil valent.*" I feel that I may be charged with inverting the order of proceeding inculcated in this sentence, by commencing my examination of the operation of pharmacological agents with subjects purely speculative. I feel also that this charge is so much the more valid, inasmuch as the hypothetical details in question lead to no practical results. But I would remark, that while, in framing general laws, it is essential we should be previously well conversant with particulars, yet it is not a necessary consequence that the same order should be followed in teaching; nay, in some instances such a mode of proceeding would be attended with manifest inconvenience. Thus, in explaining the law of universal gravitation, few persons would think it requisite to follow Newton through all those elaborate calculations by which he arrived at this general principle.

But it may be said, if a subject lead to no practical result, why discuss it? To this I cannot do better than reply in the language of Dr. Thomas Brown, in his work on the Philosophy of the Human Mind:—"To know well what hypotheses truly are in themselves, and what it is which they contribute to the explanation of phenomena, is, I am convinced, the surest of all preservatives against that too ready assent which you might otherwise be disposed to give them."

I am sure all of you will feel interested in the inquiry into the cause of those changes in the vital actions of the system produced by the agency of medicines. To what primary qualities are we to refer the vesicating property of cantharides, for example? This kind of discussion necessarily resolves itself into two parts—first, an examination of the agent (the medicine) producing the changes; and secondly, an inquiry into the nature and properties of the being in which these changes may be or are produced.

1. *Active force of Medicines.*—Medicines give rise to certain alterations in the system, which we denominate their *effects;* and we say, therefore, these agents are en-

dowed with an *active force*. But in what primary quality does this force reside? Some have directed their attention to the intimate structure, others to the chemical composition of medicines; thinking by these means to discover the cause of those changes produced on the living body by the agency of medicines. "I doubt not," says Locke, "but if we could discover the figure, size, texture, and motion of the minute constituent parts of any two bodies, we should know, without trial, several of their operations one upon another, as we do now the properties of the square or a triangle. Did we know the mechanical affections of the particles of rhubarb, hemlock, opium, and a man, as a watchmaker does those of a watch, whereby it performs its operations, and of a file, which, by rubbing on them, will alter the figure of any of the wheels, we should be able to tell before-hand that rhubarb will purge, hemlock kill, and opium make a man sleep." These mechanical notions of Locke harmonized well with those of the iatromechanical or iatromathematical sect of the age in which he lived: a sect which ranked amongst its supporters Borelli (its founder), Bellini, and others, in Italy; Sauvages, in France; and Pitcairn, Keill, Mead, and Freind, in England. They explained the functions of the body, the production of diseases, and the operation of medicines, on mechanical principles. The action of stimulants, for example, was supposed to depend on the pointed and needle-like form of their particles, and the operation of emollients on their globular form. I need hardly say, the existence of particles with the peculiar shapes assumed, is quite imaginary; and, indeed, if, for the sake of argument, we assume their existence, the action of medicines is, notwithstanding, quite inexplicable. We can, indeed, easily fancy that a ball of glass may be swallowed with impunity, and that the same substance, reduced to the form of a coarse powder, might cause considerable irritation by the mechanical action of the angular particles on the tender alimentary tube; but we cannot, on this hypothesis, explain why one medicine acts on one part of the body, and a second on another part. Quicksilver, tin-filings, and the hairs of the pod of the *Mucuna pruriens*, are still indeed employed, on account of their mechanical influence on the body. In the passage just quoted from Locke there are, in fact, two errors: first, the assumption that all the changes which take place in the external world are reducible to mechanical affections; and secondly, the presumption that we should be able to predict, without experience, the changes which would take place, supposing the assumption just mentioned were correct. A moment's reflection will satisfy us that, without experience, we should never have been able to predict occurrences far simpler than those just alluded to.

Chemical properties have been by some supposed to be those primary qualities to which we ought to refer the changes produced by medicines in the condition of the living body. At one time, indeed, it was thought that all the operations of the animal machine were dependent on chemical action. Diseases, for example, were supposed to depend on the too acid or too alkaline condition of the fluids, and medicines were presumed to act by neutralizing the one or the other of these states. Sylvius may be considered as the founder of the iatrochemical sect, while our countryman Willis may be regarded as one of its leading advocates. Although this sect has long since disappeared, among the revolutions to which medicine has always been subject, yet a modified trace of it may still be observed in the opinions of those writers who assert that to chemical properties we ought to refer the activity of medicinal substances. Barbier—one of the most respectable of French pharmacological writers, though one, I think, whose theoretical views frequently lead him to regard facts through a distorting medium—considers the active force of a medicine as consisting in a tendency which the particles of the latter have to unite with the constituents of the organized tissues. So that when a medicine is applied to the living body, its component parts endeavour to combine with the organic matter, the vital properties resist, and a new action is set up, which constitutes what we call the medicinal *effects*.

I would remark on this hypothesis, that some of our remedial means are undoubtedly to be regarded as chemical agents—for example, the caustics, properly so called; and it will be admitted, I think, that the influence possessed by alkalies and acids, in modifying the condition of the urine, is referable, in part at least, to their chemical peculiarities. In some other cases also, circumstances lead us to suspect the same kind of influence; thus we find, for the most part, that if we increase the affinity of a medicine for other agents, we frequently increase its influence over the body, and *vice versâ*. Thus the oxides of the metals are more active than the regulus, while sulphate of potash is much less active than either of its constituents.

Let us not, however, be led away by loose analogies. It is quite impossible, I

think, to admit that medicines generally are to be regarded as chemical agents. The few cases in which we have distinct evidence of a chemical operation are insufficient data on which to found a general law. Will any one be hardy enough to assert that the influence of hydrocyanic acid, or of opium, on the animal body, is of a chemical nature?

If, then, the greater number of our articles of the materia medica act, as far as we have evidence, neither by their mechanical nor by their chemical properties, to what other qualities are we to refer their operation? This question, gentlemen, is one which, in the present state of our knowledge, we are incompetent to answer. Considering the immense number of inorganic changes dependent on the agency of the electric fluid—taking into account also the wonderful relationship between electrical and vital phenomena, and the fondness of medical men for hypothesis—you will not be surprised to find that some have attempted an electrical theory of the operation of medicines. The instantaneous death caused by the application of concentrated hydrocyanic acid to certain parts of the body, is something like an electrical phenomenon.

2. *Vital properties.*—"Medicamenta non agunt in cadaver," is an axiom to which all persons will assent; and our inquiries immediately lead us to investigate the properties of living beings by which medicines are enabled to exercise their peculiar and remarkable influence. These properties or qualities are neither physical nor chemical: we denominate them vital or living: they are, therefore, essential to every organized or living part. Let me here caution you against confounding the terms *property* and *function*: the latter is the product of a peculiar organ or apparatus of organs, while the former is common to all living parts. Two vital properties have been usually described—the one called *sensibility*, the other *contractility*: by the first is meant the property or capability of receiving impressions, and by the latter, the capability of contracting or dilating—that is, of executing certain movements when the requisite impression has been made. A bean, for example, it is said, must possess both these qualities; for the act of growth is a proof that there exists internal movements; and these may be regarded as evidences of the reception of an impression of heat and moisture, without which germination cannot be effected.

But if the subject be a little more accurately examined, we shall find these supposed two vital properties are reducible to one. When a part feels an impression, it changes its mode of existence—that is to say, some kind of movement is effected in the part, which we can refer neither to physical nor chemical agencies. So that to assert a part possesses sensibility, is to express the capability of the part to act in a certain manner on the application of certain substances. Writers have in some instances described four, even five, vital properties. Bichat, for example, admits five; but three of these are evidently functions;—I mean perceptive sensibility, and the two kinds of sensible contractility (voluntary and involuntary). They are evidently performed by a distinct apparatus.

Whether we admit one or five, you will naturally inquire what agent confers this one, or these five, properties on organized beings? To this question no answer can be rendered. By one class of writers the phenomena of life have been ascribed to organic structure, just as the sounds of a musical instrument are referred to the mechanical arrangement of its parts; by another class it has been assumed that there exists a living internal principle (some have compared it to the electrical fluid), distinct from the body, and which is the cause of the organization. To enter into any discussion on these hypotheses would be out of place in a course of lectures like the present. I may refer such as are desirous of pursuing the inquiry to Dr. Barclay's work on Life and Organization.

The ultimate cause, then, of the operation of medicines (as well as of all other vital phenomena) is involved in impenetrable mystery. We know when a medicine is applied to the body it occasions some molecular movements to take place therein which are not sensible to us, and are only recognisable by their effects. But the cause and the nature of these motions are perfectly unknown. Let us turn this deficiency of knowledge to account; let it serve as a stimulus to our further inquiries. We ought, perhaps, as a celebrated German physiologist has observed, rather to be thankful that we have something yet to learn—something yet to obtain; for possession only makes us quiet, indolent, and proud. "If," says this writer, "the Deity held in his right hand all truth, and in his left only the ever-active impulse, the fond desire, and longing after truth, coupled with the condition of constantly erring, and should offer me the choice, I should humbly turn towards the left, and say, 'Father, give me this; pure truth is fit for thee alone!'"

[*Historical Table, &c.*

HISTORICAL TABLE OF MATERIA MEDICA.

EGYPTIAN MEDICINE.

BEFORE CHRIST.

Chronology doubtful.

First practised by Priests.—A temple erected to the Squill plant, under the name of *Crommyon* (Κρομμυον); Lapis ætites (a native oxide of iron); Fumigations with *Cyphi* (Κυφι), a mixture of 16 drugs; Slime of Nile; Nitrum (Carbonate of Soda?); Plasters and Unguents; Dietetical means.

HINDU MEDICINE.

Regimen; Unguents; Cataplasms; Fumigations; Baths.

HEBREW MEDICINE.

Hygiene; Cataplasms; Ablutions, &c.

GREEK MEDICINE.

To 430 B.C.

BEFORE HIPPOCRATES.—1398 B.C. Melampus cured Madness by Hellebore, and Impotence by Iron Wine. 1270, Chiron the Centaur (*Chironea Centaureum*). 1263, Esculapius: his sons Machaon and Podilirius; the latter used Bloodletting. Hecate, Circe, and Medea, (Enchantresses), acquainted with poisonous plants. Aconite; Moly (Allium?); Nepenthes (Opium?). Asclepiadeæ, descendants of Esculapius. Mineral waters; Hemlock; Elaterium(?); Scammony; Euphorbium; Cnidia coccus (Daphne Gnidium?); Colocynth, &c. Silphium (Asafœtida?) discovered by Aristæus, 617. 580—500, Pythagoras: employed Magic, Dietetics, Mustard, Aniseed, Vinegar of Squills, &c.

From 430 B.C. to 150 AFTER CHRIST.

HIPPOCRATES. 460— (?) B.C. Hippocrates of Cos, the founder of Scientific Medicine. Employed Hygienic means (Diet, Baths, Exercise, &c.); Venesection and Cupping; Malva, Linum, Glycyrrhiza, Mel, Cera, Rosa, Gallæ, Punica granatum, Allium, Scilla, Veratrum, Helleborus, Staphisagria, Sinapis, Elaterium(?), Scammonia, Daphne, Ruta, Κανθαρις (Mylabris Cichorii?), Piper, Cardamomum, Cinnamomum, Cassia, Mentha, Anisum, Coriandrum, Cuminum, Anethum, Ammoniacum, Sagapenum, Galbanum, Silphium (Asafœtida?), Pix, Juniper, Styrax, Mastisches, Myrrha, Castoreum, Crocus, Conium, Hyoscyamus, Opium, Sulphur, Nitrum, Alumen, Sal commune, Cerussa, Acetas Cupri, Ferrum, Arsenicum, &c.

ANCIENT DOGMATIC SCHOOL. 308 B.C. Founded by Thessalus and Draco (sons of Hippocrates) in conjunction with Polybius.

NATURAL HISTORIANS. 350 B.C. Diocles of Carystus, Ριζοτομικα. 384—322 B.C. Aristotle on Animals (also Plants and Pharmacy). 371 to 286, Theophrastus of Eresus, founder of Botany.

ALEXANDRIAN SCHOOL. 300 B.C. Medicine separated into Dietetics, Pharmacy, and Surgery. 295, Herophilus of Chalcedony employed Compound Medicines. 293, Erasistratus of Cos rejected Bloodletting: Simple Medicines.

EMPIRIC SECT. 286 B.C. Founded by Philinus of Cos. 240, Serapion of Alexandria. Heraclides of Tarentum (the "Prince of Empirics.") Attalus. 138, Nicander, (Θηριακα and Αλεξιφαρμακα). 135, Mithridates.

METHODIC SECT. 100, B.C. Asclepiades of Bithynia: 60, his pupil Themison founder of the sect. All medicines Astringents or Relaxants.

ITALIANS.

23 A.D. Menecrates; employed Escharotics; Diachylon Plaster. 50, Celsus (from 13 to 55.) Nourishing Glysters; Frictions with Oil. 70, Pliny, the Natural Historian; died 79. 230, Cœlius Aurelianus.

54 A.D. (?) Pedacius Dioscorides, the most celebrated of the old writers on Materia Medica. Date uncertain.

From 150 A.D. to 700 A.D.

GALEN TO THE FALL OF THE GREEK SCHOOL. 131—200 A.D. Claudius Galen, born at Pergamus. Diseases produced by alterations of the Humours, or πνευμα. Medicines act by their elementary qualities (heat, cold, dryness, moisture,) of each of which there are four degrees. This doctrine was held for 1400 years.

360 A.D. Oribasius. 550, Ætius: Camphor, Musk, &c. 560, Alexander of Tralles: Rhubarb, mild Laxatives. 650, Paulus Egineta.

AFTER CHRIST.

CHRISTIANS.

From 700 A.D. to 1100 A.D.

SCHOOL OF SALERNUM. Founded by Benedictine Monks: became celebrated about the eighth century. 1087, Constantine the African died. 1100, John of Milan ("Regimen Sanitatis Salerni.") 1110, Nicolus Præpositus. Diplomas granted. 1140, Matthew Plauter.

From 1100 A.D. to 1500 A.D.

DARK AGES. Medicine practised by Monks, who mixed superstition, magic, and astrology, with the grossest imposition.

1215, Gilbert: Acetate Ammonia; Oil of Tartar per deliquium; Bath Waters. 1193—1282, Albertus Magnus. 1260, John of St. Amand. 1214—1284, Roger Bacon. 1240—1313, Arnold of Villa Nova. 1235—1315, Raymond Lully. 1317, Matthew Sylvaticus. 1343, Dondis (father and son). J. Platear. St. Ardouin: Hydrarg. Oxyd. Rub. 1394, Basil Valentine: Prepared Chemical Medicines; introduced Antimonials, Preparations of Lead, Ammonia, &c. 1407, Mercurial Fumigations. 1508, Guaiacum. 1518, Mercury internally. 1545, Rad. Chinæ.

PARACELSUS. 1493—1541. Doctrine of Signatures. Overturned Galenism. Used Chemical Medicines; formed Tinctures, Essences, and Extracts.

ARABIANS.

Doctrines of Galen. Mild Laxatives (Manna, Tamarinds, Senna, Rhubarb, Cassia) in place of Drastics. Chemical Medicines. Syrups, Juleps, Conserves, Loochs, Robs.

Schools of Nisapour, Bagdad, Damascus, and Cordova.

702 A.D. Geber, the patriarch of Chemistry. 852 to 932, Rhazes. 865, Mesue the Elder. 880, Alkendi. 978 to 1036, Avicenna: for many centuries regarded as infallible. 1002, Serapion the Younger. 1017, Mesue the Younger.

GREAT BRITAIN.

From 1500 A.D. to the Present Time.

1579 Winter's Bark
1683 Serpentaria (Johnson)
1674 Willis (Pharmaceutice)
1682 Lister (Mineral Waters)
1693 Dale (Dispensatory)
1695 Epsom Salt (Grew)
1697 Sulphuric Acid from Sulphur
1702 Mead (Poisons)
1736 Senega (Tennent)
1739 Spigelia (Brown)
1753 Lewis (Dispensatory)
1758 Kino (Fothergill)
1763 Willow Bark (Rev. E. Stone)
1770 Alston (Lect. Mat. Med.)
1774 Oxygen (Priestley)
1775 Digitalis (Withering)
1778 Simaruba (Wright)
1779 Red Bark (Saunders)
1780 Brown, (Elem. Medicinæ). All medicines regarded as stimulants.
1788 Angustura Bark (Ewer)
Monro, Donald (Pharmacy)
1789 Cullen, (Mat. Med.) A solidist. All medicines act by motions excited and propagated in the nervous system.
1791 Woodville, (Med. Bot.)
1793 Rhus Toxicodendron (Aldersoo)
1794 Yellow Bark (Relph)
1796 Pneumatic Medicine (Beddoes and
1800 Duncan, Jun. (Dispensat.) [Watt)
1803 Cinchonia (Duncan)
1804 Murray (Mat. Med.)
1805 Hamilton (Purgatives)
1808 Pearson (Synopsis)
1811 A. T. Thomson (Dispensatory)
1812 Paris (Pharmacologia)
1813 Ainslie (Mat. Indica)
1813 Young (Classificat. Mat. Med.)
1820 Iodine in Bronchocele (Coindet)
1825 Phillips (Pharmacopeia)
1825 Brande (Pharmacy)
1829 Christison (Poisons).

GERMANY.

1536 Sulphuric Æther (Valer. Cordus)
1538 Cammerarius, Jun. (Bot.)
1631 Tartar Emetic (Myosicht)
1658 Sulphate of Soda (Glauber)
1669 Phosphorus (Brandt)
1677 Wedelius (Pharmacy)
1679 Wepfer (Poisons)
1681 Nitric Æther (Kunkel)
1687 Cascarilla (Stisser)
1688 Magistery of Opium (i. e. Morphia: Ludwig.)
1701 Rivinus
1712 Kæmpfer
1717 Ol. Cajuputi (Locher)
1718 Hoffmann
1740 Neumann (Pharm. Chem.)
1758 Vogel, R. A. (Hist. Mat. Med.)
1760 Stœrck. Crantz
1767 Munch (Belladonna)
1774 Murray (App. Med.)
1790 Gren (Pharmacology)
1791 Arnemann (Mat. Med.)
1792 Trommsdorf (Pharmacy)
1793 Schlegel (Thesaurus)
1795 Gmelin (Min. Mat. Med.)
1800 Swediaur (Mat. Med.)
1802 Frank (Mat. Med.)
1802 Hayne (Botany)
1804 Morphia and Meconic Acid (Serturner)
1805 Bertele (Pharmacodynam.)
1807 Burdach (Mat. Med.)
1808 Pfaff (Mat. Med.)
1810 Hahnemann (Homoiopathia)
1816 Hüfeland (Consp. Mat. Med.)
Voigtels (Mat. Med.)
1819-22 Schwartze (Pharm. Tables)
1820 Tiedemann and Gmelin (Physiol.)
1821 Vogt (Pharmacodynam.)
Nees von Esenbeck (Botany)
1825 Bischoff (Mat. Med.)
1826 Bergen (Cinchona)
Richter (Mat. Med.)
1827 Geiger (Pharmacy)
Göbel (Pharmacognosia)
Brandt and Ratzburg (Med. Zool.)
1830 Creosote (Reichenbach)
1832 T. W. C. Martius (Pharmacog.)

AFTER CHRIST.

From 1500 A.D. to the Present Time.

FRANCE.

1544 Sylvius (Meth. Medic. Compon.)
1566 Antimony proscribed
1666 Antimony permitted
1672 Tartarized Soda (Seignette)
1694 Pomet (Drugs)
1697 Lemery (Pharmacopœia)
1700 Goulard (on Lead)
1702 Boracic Acid
1707 Kermes Mineral
1709 Chomel (Plants)
1717 Tournefort (Mat. Med.)
1723 Simaruba
1741 Geoffroy (Mat. Med.)
1762 Baumé (Pharmacy)
1780 Venel (Mat. Med.)
1789 Desbois de Rochefort
1803 Narcotine (Derosne)
1804 Decandolle (Med. Prop. Plants)
Alibert (Mat. Med.)
1805 Schwilgue (Mat. Med.)
Barbier (Mat. Med.)
1809 Magendie (Act. Strychni)
1812 Chlorides of Lime and Soda (Mazyer)
Picrotoxine (Boullay)
1813 Iodine (Courtois)
1814 Morphia (Robiquet)
1814 Orfila (Toxicology)
1817 Emetia (Pelletier and Magendie)
Medicinal use of Prussic Acid (Magendie)
1818 Strychnia (Pellet. and Caventou)
1819 Brucia (do.)
Veratria (do.)
1819 Loiseleur-Deslongchamps (Med. Plants)
1820 Quinia (Pelletier and Caventou)
Virey (Nat. Hist. Med.)
Guibourt (Drugs)
1821 Chlorides of Lime and Soda (Labarraque)
1822 Barthez (Mat. Med.)
1823 Richard (Med. Bot.)
1824 Fee (Nat. Hist. Med.)
1825 Chevallier
1826 Bromine (Balard)
1829 Merat & De Lens (Dict. Mat. Med.)
1832 Narceine (Pelletier)
Codeine (Robiquet)
Meconine (Couerbe)

SPAIN.

1530 Sarsaparilla
1538 Sassafras
1563 Garcias ab Orta (Drugs of India)
1574 Monardes (Drugs of West Indies)
1578 Costa (Drugs of East Indies)
1638 Cinchona
1787 Rodriguez Tavares (Pharmacol.)
1789 Rancé (Mat. Med.)
1796 Krameria (Ruiz)

ITALY.

1538 Mathiolus
1545 Brassavola (Simple Med.)
1592 Valerian (Columna)
1675 Calumba
1701 Sugar of Milk (Testi)
1734 Mazini (Medicam.)
1797 Brera (Medicines by Friction)
1798 Chiarenti (do.)
1808 Doctrine of Contra Stimulus
1811 Chrestien (Iatraleptice)
1817 Alberti (Flora Medica)
1826 Stellati (Mat. Med.)
1828 Bruschi (Inst. Mat. Med.)
Taddei (Pharmacology)

HOLLAND, &c.

1552 Jalap (Dodoens)
1574 Dodoens (Plants)
1576 Clusius (Plants)
1574—1644 Van Helmont (Chem.)
1648 Ipecacuanha (Piso)
1674 Maregraave (Mat. Med.)
1719 Boerhaave (Mat. Med.)
1799 Ypey (Mat. Med.)

SWEDEN.

1749 Linnæus (Mat. Med.)
1756 Quassia (Rolander)
1774 Chlorine (Scheele)
1778 Bergius (Mat. Med.)
1797 Björnlund (Mat. Med.)

AMERICA.

1798 Barton (Mat. Med.)
1817 Chapman (Mat. Med.)
1817 Bigelow (Botany)
1822 Eberle (Mat. Med.)
1825 Coxe (Dispensatory)

VARIÆ.

1588 Treatise on Medicines in Russian
1633 Simon Pauli (Veg. Med., Denmark)
1665 Botanical Garden at Moscow
1670 Borrich (Chem. and Bot., Denm.)
1673 Iceland Moss (Borrich)
1749 Haller (Botany, Switzerland)
1802 Ipecacuanha plant (Gomes & Brotero, Portugal)
Cinchonia (Gomes, Portugal)