An inquiry into some late "Remarks on the Brunonian system.".

Contributors

Shattuck, George Cheyne, 1783-1854.
National Library of Medicine (U.S.)

Publication/Creation

Boston : Published by D. Mallory & Co. ; Portland [Maine] : Lyman, Mallory, & Co. ; Middlebury, Vermont : Swift and Chipman, 1810. ([Boston] : Armstrong, printer)

Persistent URL

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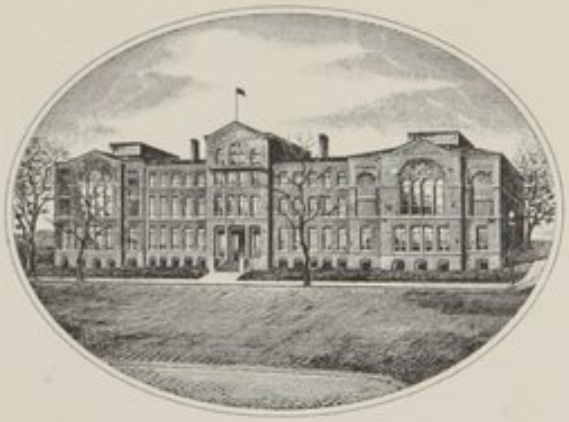

Founded 1836

U. S. Department of Health, Education, and Welfare

Public Health Service

AN

INQUIRY

INTO SOME LATE

"REMARKS ON THE BRUNONIAN SYSTEM."

"Ubi plura nitent, non ego paucis offendar maculis." HOR. *Arte Poet.*

"In all bodies, endued with life, a certain property is present by which they are enabled to receive the impression of powers applied The late ingenious and philosophic Brown distinguished this property by the term Excitability, without referring it to the nerves or muscular fibre in particular" *Physiological Essay, Wm. Alexander, M. D.* MANCHESTER MEMOIRS, vol. i.

PUBLISHED BY

D. Mallory & Co. Boston; Lyman, Mallory, & Co. Portland; and Swift and Chipman, Middlebury, Vermont.

Armstrong, Printer.

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INTRODUCTION.

In a late medical Dissertation much labour has been bestowed to prove "that the many practitioners are followers of the Brunonian system and advocates of its general principles almost without knowing they are so." This remark is predicated on the general prevalence of these doctrines over those of any one teacher in the medical world.

How all this has occurred is surely an important inquiry. Is it true that this system has obtained so much acceptance unmeritedly, to the imminent hazard of the health and lives of mankind, that it ought to be deprecated as a curse to society?

In the following pages we propose to offer some observations on Brown's general propositions, in reply to the remarks contained in the Dissertation. If there be any truths in the system they may be ascertained by inquiry. If there be errors they ought to be detected. No known systems are perhaps without errors, nor entirely devoid of truth. Whatever justness there may be in some of the remarks of Brown's zealous opponents, I believe, with a great and distinguished medical writer, that "the introduction of his doctrines, so far from proving 'a curse to mankind' will be the mean of bringing about a thor-

ough lustration of opinions in Medicine." By awakening a spirit of free inquiry, and rousing the energies of genius and *industry*, pernicious prejudices will yield to enlightened research.

AN

INQUIRY.

THERE is no profession which has been more fettered by contradictory opinions than that of Medicine. Conjecture has been heaped upon conjecture, book upon book, till our libraries have become more notorious for ponderous tomes than for principles of solid instruction.

But it is now universally agreed that observation and experience are the surest guides to knowledge. Theories are often mere efforts of ingenuity to gratify pride of opinion; but principles drawn from an attentive observation of nature, like problems in mathematics, are capable of demonstration. "Words which do not relate to some object or perception of sense or do not express some effect, the result of the operation of sense," ought not to be adopted in our discussions, unless by common consent for the purpose of generalizing our ideas and the convenience of expressing them in a collective sense; "nor ought general terms to be employed unless we can substitute particular terms expressive of appearances

in their place." Such is the nature and extent of the term excitability adopted by John Brown to express our ideas of the peculiarities, which distinguish animated beings from dead matter. He has used *it* in such a sense as every philosopher may use it, and has prudently forborne all speculations as to its cause. That this term has been abused there can be no doubt, but that can be no argument against our employing it. The word is not important—some general term must be used—one may be as good as another.

Under the head of the first proposition as laid down by Dr. Beddoes, are contained the objections in the Remarks to the use of this term stated as follows: "I am not contending that there is not some principle or property common to vegetables and animals, but that this common principle is not, so far as we know, the source of all those properties which are peculiar to them as living beings. Such a principle should not receive a name which implies any peculiar character, unless that character certainly belongs and is appropriate to it."

Here we are permitted to infer that "there may be some single principle from which all the phenomena of life arise." What this *supposed principle* is we are not informed. We cannot therefore be prepared to develop the cause of life. Now Brown has no where employed the term excitability as synonimous with the cause of life; but he has demonstrated its existence by the effects discoverable in living beings, on the application of their appropriate stimuli.

These phenomena alone thus produced, constitute the only evidence of life; for the power of life is the power of God made known to us by certain signs or effects, peculiar to the individual endued with this power, but subject to some known physical laws.

By the operation of these causes, motion, sensation, mental exertion, and passion are originated and maintained. If the body be excited by external agents, called by Brown exciting powers, so that either one or more of these properties may be produced, there is life. Excitability may be shewn in one or more of these phenomena, but is equally discoverable in them all. This doctrine conveys no idea discordant with any known law of the animal economy. No man will believe that digestion is a simple motion of parts, but every one may see that unless excitement can be produced in the stomach, and its excitability be well enough sustained, that the chemical affinities producing chyle cannot take place. No one will believe that the stimulus of light could be so adapted as to produce sound, any more than that the embryo of a man could grow in the matrix of an ass. Though there be more things in earth and heaven than are dreamt of in our philosophy, the imagination of Brown did never attempt to make oysters sing or stones prate; on the contrary he agrees with every philosopher that the different organs possess different susceptibilities to the influence of their appropriate stimuli. Excitability is not the cause of the phenomena of life, but the medium by

which we become acquainted with these phenomena. It is neither the cause nor source of life, but a property common to all living beings, whose effects vary with the particular animal or organ in which, so far as our observation extends, excitability may be found. There is a power of life in the eye whereby the rays of light producing colour are received and communicated to the sensorium commune; the organ of sense to be acted upon in this case is the retina. If light fall upon it, the sensation of color is produced. If it be withdrawn the same effects result as if the power of life in the retina was destroyed. This power remaining, nothing is requisite to produce the phenomena peculiar to this organ of sense, but the presence of light. If this continue to operate and occular spectra cannot be formed, the excitability of this organ is either suspended or exhausted. If excitability be lost, light no longer produces spectra, nor vibration hearing; mobility, sensibility, and mental exertion cease, and death ensues.

Excitability moreover may be extended to every thing that is vital in nature, to vegetables and animals of the lower tribes, in which neither brain, spinal marrow, nor nerves have as yet been discovered; as the polypi, tænia, hydatides, and many insects. The sea anemonies are exceedingly gelatinous and at the same time so *irritable* that even light affects them, though to all appearance destitute of eyes. There are many other irritable marine productions extremely gelatinous in which neither fibres resembling mus-

cles nor nerves can be discovered. The irritability of muscular fibres is affected according to some known laws by certain physical agents. From some late observations and experiments, it should seem that the ever mobile Iris is not subject to such laws, and is not affected in the same way by any of the physical agents which occasion contraction in muscles.* We have further proof of the existence of this principle in the motions of the mimosa pudica,

* The following experiments in proof of this position are highly interesting. The subject of them was a young cat, an animal in which the Iris is extremely active. "A wire of silver and of brass were passed so smooth as very little to injure the structure of the eye through the cornea to the uvea by small holes made in the cornea, the ends of the wires were then brought into contact; no motion could be perceived in the Iris, though the muscles of the lip and nose were much agitated. The wires were then passed on to the retina, and the extremities again brought into contact by their exterior ends; no motion could be perceived in the Iris: the wires were now passed still further till they were made to enter the foramen opticum, and the outward extremities were again made to touch, but no motion could be perceived in the Iris in each trial, though made on both eyes, yet all the muscles of the face and head were made to contract by the same applications. Zinc was tried in place of brass but without any alteration. The object had in view in pushing to the foramen opticum was attained, as the needles had, on dissection, been found to have been in contact with the lenticular ganglion, from whence the nerves originate which supply the uvea. It follows that the Iris is not affected either by metals applied to its fibrous structure or to the origin of the nerves which supply it. It was further ascertained, that a silver probe pushed into the brain of a frog through the canal of the spinal marrow, and made to communicate with a plate of zinc on which the detached head was laid, occasioned a winking motion in the eye, but not any motion in the Iris. Light therefore acts on the eye without the intervention of muscular irritability."

the convulsive contraction of the stamens of the common barberry, and in all those motions, which take place in plants of every description in the progress of their development. Believing the inferences which will naturally arise in every mind from a consideration of these facts and phenomena to be just, where is the impropriety of applying the term excitability as expressive of susceptibility to the influence of exciting powers, which is surely more comprehensive of these varied properties resulting from the power of life, and more appropriate as a general term, than any hitherto employed; and moreover, when we consider that either mobility, irritability, or sensibility may be adopted as substitutes to express particular appearances.

If we consult the best informed writers on natural history, we shall find all their attempts to define and prescribe the boundaries between animal and vegetable life, or to point out the source of primary motions, have exceeded the limits of their comprehension. I might cite the names of Icong, Boerhaave, Tournefort, and the immortal Linnæus himself, who, in contemplating the productions which occupy the borders between these two kingdoms, is uncertain to which order of beings to refer them. That we shall ever arrive at a correct definition of life by chemical analysis, seems little probable; as the result of such inquiries can only explain the properties of dead matter. Have we any reason to expect any more success from an investigation of

those authors who have written so many theories, or rather contradictory opinions, to account for the operations of life? In the "Remarks" life is defined to consist in an inherent property totally independent of action. Mr. Hunter has defined it, "that principle which preserves the body with or without action, and is the cause of all its actions." We are yet to learn what ideas are conveyed by such language. The highly respected Dr. Goodwin defined life the faculty of propelling the fluids through the circulating system. But this does not analyze what is life. It merely describes some of the phenomena. The definition is not more clear than the term it defines. Let us quit the *magic* of mystery for the *light* of experience. This will enable us to describe effects, to point out their relations, which we may express in comprehensive terms. If, indeed, we can gain nothing by reasoning upon the power of life, why talk about it, why not employ our time in observing those laws by which it is maintained? Life is the object of no sense; the phenomena of living beings, which are the result of action and reaction, are the only and proper subject of physiological research. All inquiry, therefore, into occult supposititious powers and faculties, must end in dissatisfaction and uncertainty. In all instances of living bodies, information must be obtained by direct observation; the object must be presented to some of our senses: we shall afterwards understand each other when speaking on the subject.

On the second part of the first proposition as divided in the "Remarks," it is not necessary we should be detained long. Whatever excitability is, whether a quality or substance, a certain portion only is assigned to every living being, at the commencement of its living state. In other words every individual being is endued by nature with a certain portion of vital power which he cannot augment, for if this were possible it would be equally in his power to prolong existence beyond the period of its natural decay. However strong or feeble may be this original power which constitutes different idiosyncrasies among organized beings, it is constantly subjected to states of increase and decrease by the actions of the body on the mind.* It fluctuates from weakness to vigor, the functions alter, are debilitated, or renewed again in their usual strength, according to the nature of those stimuli which are applied to them, and the relative condition of the individual at the time of their application. "The degree of excitability is, therefore, different in different animals, and in the same animal at different times." It is constantly varying with the state of our habits, the power of which equally controls the physical or the moral man. But health, nevertheless, consists in an easy and exact use of all the functions. Does it follow that because different persons have fixed in different

* Hence the importance to the physician of a thorough knowledge of the various idiosyncrasies in his treatment of diseases—"If I knew, said Galen, all their variety, I should think myself a God."

states of excitement to promote pleasure and ease, there is no standard of health consistent with reason and nature? Physical and moral health, so far as our natures are capable, is to be sought in open air, regular exercise, and a temperate use of those things which produce and maintain excitement. This establishes that mean state, which is, according to Brown, the proper standard of health. It would be adopting a most miserable rule of practice, because the passions and follies of mankind have rendered it necessary to use opium, wine, and mercury to restore an exhausted excitability, excite pleasing sensations, remove distress, and destroy poison, that therefore there is no period when their application may be suspended, the former producing those sensations, and the latter curing syphilis. Truly, increased excitement no more implies increased vigor of action, than the agreeable wit of an intoxicated brain implies strength of intellect.

The second and third propositions we pass over with the Remarker, and proceed to the fourth.

It is obvious from what has been advanced, that every attempt to explain the cause of life, must terminate in a mere description of its phenomena. If these phenomena are sustained by the operations of agents foreign to the body, the withdrawing of them must produce death, or, more properly speaking, a suspension of all the motions peculiar to life.

The most striking analogy hitherto discovered by philosophers, in relation to the life of plants as well as animals, is the property the individuals of each class possess of evolving calorique. This power in plants is supposed to produce a chemical combination with hydrogen from the decomposition of water, while oxigen gas is suffered to escape. In the decomposition of water by vegetation, the condensing hydrogen is supposed to supply the calorique, by which the oxigen is rendered elastic. By this decomposition of water also in vegetation, the condensing hydrogen may, with equal probability, preserve the temperature of the vegetable; for the quantity of water decomposed by some plants is very great, and their capacity for calorique is less than that of water; besides that, the volume of hydrogenous gas is more than twice as great as that of oxigenous gas which enters as a constituent of water.

If the temperature of vegetables be owing to their combination with hydrogen obtained from water in the gradual evolution and formation of the plant from its seed, will it be argued that these properties could take place independent of external agents or stimuli? Are these phenomena an exception to the law that action generally is maintained by stimulus? The invisible power or susceptibility in the organized particle, the seed, it is said in the Remarks, is one of the properties of life. What answer would occur to the simple farmer or the erudite botanist to the following question, demanded

to be solved by the doctrine of stimulus in relation to the seed—viz. "What is the stimulus by which life is maintained in the seed?" We will venture the opinion, that unless it should so happen the seed had been preserved in a proper temperature, been put into the ground, and subjected to the action of light, air, moisture, and calorique, it might have retained its motionless faculty for ever. Philosophers (even in in this age of freedom and licentiousness) would not have discovered that seeds could by such strange agents have sprung up into cabbages, potatoes, and whole fields of wheat. "Verily had not the corn fallen into the ground, it would have abided alone and finally withered in its own covering." Does a faculty to be excited constitute actual excitement? A faculty or power does not constitute phenomena, for these are the result of power; nor can a power be said to exist, when no effect could be made to take place. Beyond this is poetical fiction, not science. What connexion then have the above phenomena with an occult *suppositious faculty?*

Further, the power of life in a seed, is excited to action by its own appropriate stimuli communicated to the plantula through the perisperma and cotyledons to which the embryo plant adheres by a ligament, similar to the umbilical cord which unites the fœtus to its parent. The ovary of plants has been fitly compared to the uterus in animals, the seed to an egg, formed by the utricular texture of this organ. Are these phenomena independ-

ent of stimulus and consequent action? The faculty of the seed to produce its kind, it is well known is caused by the stimulus of the pollen which is necessary to the fecundity of plants. In vegetables, moreover, generation will arise among the different florets of the hermaphrodite classes (the gynandria and synge nesia) the pollen of each floret impregnating its respective germ. Every farmer may see the operation of this law. Take, for instance, the Indian corn, an indigenous plant of our soil, multilate this organ which forms a plumage on the apex of this plant and the corn is blasted, preserve it and the different organs will commix their properties. The mutilations of the florets of plants is supposed to resemble the state of castration in animals, but from late experiments, the mere approach of the filaments to the stigma has been found sufficient to secure the impregnation of the germ, notwithstanding the removal of the antheræ, and even the removal of a portion of each filament. This shews that the stimulus and excitement produced by this partial loves of plants even in mutilated organs, is essential to their fecundation. Further. The seed buried in the earth first swells by the agency of water; the radicle elongates; in its descent the root is gradually formed, the plumula arises, ascends into the atmosphere, the seminal leaves unfold, the stem and trunk progress, till, at last, a general support is established to the various parts of the plant. Foliation and fructification are successively renewed in the discharge of its

regular functions. Solar light is the efficient agent by which these effects are produced, and without "whose quickening glance" vegetation, sensation, and animation would cease upon the surface of our planet.

Thus the vital properties of the vegetable are developed from its seed, and, in the decomposition of water, calorique is probably supplied for the preservation of its temperature, colour, taste, and smell. Some experiments of Mr. Bell's, in a Thesis published at Edinburgh, have ascertained that plants immersed in hydrogenous gas, have been known to retain these properties though secluded from light. The loose calorique evolved by the condensing hydrogen, will perhaps account for the appearances exhibited in these experiments.

We will now pass to another consideration. It is objected to Brown, that on his theory, life is owing to stimulus applied to inanimate matter. If by these terms, it is to be understood that the organized body of an animal, after being submersed under water for several hours, by which respiration is suspended, circulation stopped, and every sign of life departed, that the individual is void of life, so far as it is a subject of our knowledge, there cannot be any solid objection to the proposition. Shall we conclude, because in some cases of the most decided asphyxia excitability has not been renewed, that therefore we shall despair of ascertaining even to

what stimulus the body in such a state of indirect debility may yet remain susceptible?

The power to resuscitate is known to depend for its success on the more or less complicated organization of the individual body. If as adequate an application of stimuli could be made to the body of a stupid hedge hog, a frozen frog, or the dried, parched wheat insects, as related by Fontana, might we not be able to produce similar results? Our ill success in a case of asphyxia may more often arise from our uncertainty of the degree and duration of the stimulus to be applied, than from our not possessing agents in themselves sufficiently intense. It appears from some further experiments of Fontana's, that the peculiar insects which are found in mildewed wheat, though reduced to a state of desiccation in which they cannot be distinguished from inanimate saw-dust, yet remained organized, and were found susceptible of excitement. The most important practical advantages have already been furnished by the labours of this and other philosophers, and indulge us in the hope, that a human body, inanimate to every appearance, may yet be capable of resuscitation, provided the system has not received any organic lesion or sensible putrefaction, by which the communication of the vital actions is cut off. It is an acknowledged fact, that if any organ of the body retain its excitability at the same time others have lost the power of being excited, the organ retaining its susceptibility to the influ-

ence of stimuli, upon the judicious application of its appropriate stimulus, will not only be excited to action, but may gradually raise to excitement all the other parts of the system.

Life is life whether in a wheat insect, a polypus, or a man. The difference consists only in the multiplied modes of operation in the latter, compared with those of the former. These modes of operation are not dependant on an inherent power or voluntary agency residing in the particular body, but on agents foreign to that body. The property then by which living may be distinguished from dead matter is this, that when an organic body is placed in such circumstances that it may be and is subjected to the operation of appropriate stimuli, cæteris paribus, the functions peculiar to that body may be excited. But if life be a power independent of either organization or action, or foreign agents, the absence of the latter could neither suspend or destroy it. The aquatic may change his condition with the terrestrial animal, and either might exist, although according to laws of which we are totally ignorant. If the *sun* breed maggots in a *dead dog*, how are they generated?

Life, agreeable to J. Brown, cannot be said to exist, till excitement is produced; and this it is which characterises in their multifarious states the vegetable and the animal, from themselves in their dead state. Another argument is here brought forward on the supposition, that if, according to Brown, excitability was not extinct, in cases of asphyxia the

action of the system ought to be maintained by the operation of the blood and secreted fluids which are become stimuli present in the system. That is to say, though the vessels of the body are deprived of all those agents on which their vital actions depended, yet the inherent power has now fled to the fluids, where it may exercise its faculty like the tanner in Shakespeare, the tougher the animal's hide, provided he is well filled with juices, he may live ever so long. We are told the peculiar action of the vessels is the cause of their properties, but now it seems they have changed places, and the fluids have gained the power. We conclude with Brown "that life is a forced state" that vegetables and animals are subordinate beings, over whom supreme Intelligence could, without any foreign agent, have produced all that we see, hear, feel, or that our minds compare, divide, and by the power of speech communicate; but having adopted other dispensations, it is not for us to infer that he has not employed instruments to accomplish his designs, against the strong evidence of observation and fact that he has.

From what has been advanced, we ask, whether it has not been shown by what agents or stimuli nature originally endues the seed with the power of germinating upon the application of all the appropriate stimuli, and whether the author of the Remarks has not confounded cause with effect in calling a power of being excited, actual excitement? What ideas then should we have gained by a faculty to be excited, if

excitement had not been produced? If motion, light, and calorique, had not been communicated to matter, the laws of attraction and repulsion could never have produced this state of progressive change; this world of order and of beauty would still have been left void and dark.

Fifth Prop.

The author of the Remarks having confounded physical excitement with the chemical changes which take place in digestion and the various secretions, has raised up a man of straw, and, having beaten him to the ground, fancies Brown at his feet. It is not attempted in any part of his system to define and point out the particular law by which these alterations of property are effected.

Physical excitability existing together with a just measure of excitement and temperature, is all that is affirmed in regard to these subtile operations, of which we can form no other idea, than by conceiving of them in a manner similar to actual phenomena.

The tears secreted in the lachrymal gland, the mucus discharged from the nose and mouth, are not the same in quality or quantity, when the excitement of the vessels of these organs is too great, too small, and not in just measure. The changes of quality of the fluids, varies with the state of action in the finer vessels by which the affinities of the elementary principles composing their contents are altered, and of course their properties.

These observations will apply to the process of vegetable secretion. The properties of fruits are known to vary in relation to their more or less direct exposure to the action of light, by which these properties are distinctly altered. These secretions differ from the succi proprii of the plant, as do the glandular secretions from the circulating blood in the animal body, but is there nothing to be found in the secreted fluids which is also to be found in the blood? Do not the same elementary principles differently arranged constitute blood as well as bile? When the particular law of modus operandi shall be pointed out, by which blood is formed from chyle, we shall be ready to understand what is meant by peculiar action to account for any secretion secerned from that compound fluid; till then we may rest satisfied with Brown's theory, that the excitement may be too great, too small, or in just measure, the influence of which in the various organs must be to produce correspondent changes in the affinities of their fluid contents. "The theory of any particular fact derives much strength in tracing its analogy by the testimony of the senses, with other parts of nature's operations."

The grafting of various fruits upon the stock of trees of similar habits, may be compared to the secretions from the blood in the various organs of the animal body. In which they may be regarded as chemical apparatuses, wherein, by a due regulation of excitement, these changes of

property are formed and completed. The investigations of Lavoisier and other chemical philosophers have ascertained that the principles of vegetable secretion, are furnished by a triple combination of hydrogen, carbon, oxigen, and sometimes azote, obtained from water, carbonic acid, and manures in which carbon and water abound. These principles are taken in by the capillary vessels of plants, assimilated to their bodies, and thus furnish the materials of their growth.

In the Georgicks of the sublime, enchanting bard of Mantua, we have a beautiful illustration of this fact.

> "Plantæ immittuntur: nec longum tempus, et ingens
> Exiit ad coelum ramis felicibus arbos,
> Miraturque novas frondes, et non poma."
>
> VIRGIL. *Georg. Lib.* 2.

We can judge of these actions only by the chemical effects produced. These modes of action, which we do not see, we can form no opinion respecting. On Brown's theory we may all comprehend that unless a due and regular excitement be kept up in the different organs by the exciting powers, excitability is either directly or indirectly exhausted, the solids and fluids become diseased in quantity as well as quality, and further, if these exciting powers be withdrawn, death ensues, as certainly as when excitability is gone.

Excitement is to physiology what calorique is to chemistry; on the due regulation of both depends

the alteration of properties among bodies subjected to operations, whereby new states of union are formed. In the artificial hatching, for example, of a chicken, if the temperature necessary to effect the operation be duly maintained, we have a living animal produced; increase that temperature, and the component parts will be dissolved and putrefy; reduce it, and the whole is consolidated. There is no other known cause of difference of property, than a difference in the just measure of temperature or degree of calorique. Apply the same mode of reasoning to the physico-chemical machine of man.

In the organ of the liver, the blood undergoes changes in the intimate state of the union of certain of its elementary principles, from which results what is denominated bile. Here again there is no other known cause of difference of property, than what may arise out of the degree and duration of excitement, to which the blood is subjected in the vessels of that viscus. For if by any cause the excitement is increased, as by inflammation, the solids, as well as the fluid contents become morbid, their state of affinity is altered.

If duration and degree of action will account for actual phenomena which continually arise, and are the subject of our experiments, why may we not account for changes which take place in the system of the animal body, which are not in their effects more curious or strange. To say that they are the result of peculiar modes of action, is only substitut-

ing terms to express our ignorance of the modus operandi or particular law of vitality in the organ, to cause these differences in the secreted fluids. It is converting the body of man into the work-shop of a mechanic, where nature must employ as many ways and means to put in operation her simple laws, as a carpenter does tools to work his orders of architecture.

The action, therefore, of vitality, we conceive is one, uniform, and simple, differing only in degrce, through all the vessels; but the chemical changes of property resulting from it, must vary with the degree and duration of the action to which that compound fluid, the blood, is subjected in its passage through the various complicated organs and finer vessels of the body.

To the question, in what other manner than by a reference to *peculiar modes* of action, can we account for the distinguishing characteristics, for example, between the vaccine and variolous pustules, we answer, if, by the term *peculiar modes* of action, is meant a difference in the appearance of the two diseases, it is universally admitted; but if it is intended to explain in what that difference of action consists, when the effects alone of those actions are a subject of observation, and while the nature of even the simplest action of life remains unexplored, we cannot perceive any advantage to be gained by adopting the term.

Sixth Prop.

On the subject of direct and indirect debility which constitute, according to Brown, all diseases, no objection has been offered, but that, in cases of direct debility, excitability is not in excess, and that in these instances there is not power sufficient to support *great action.* What is a want of power to support great action, but a state of direct debility; and what is a state of direct debility, but that, in which all stimuli have a greater effect than usual; that is, they produce great debility in consequence of the accumulated excitability of the animal or, in other words, greater susceptibility to the operation of stimuli, of which the system had been deprived. According to the same experiments of Dr. Wilson, opium exhausts an animal less soon, when the contractions of the voluntary muscles occasioned by it in some circumstances are less violent. The effects of emetic tartar upon young whelps, as related in Mr. Coleman's experiments, are of similar import, and show why stimuli exhaust an animal less, in proportion as its sensibility is less; for an accumulated excitability is accompanied with a decreased languid excitement in all the vital actions of the system, arising either from defect or subduction of stimuli. Hence the effects of vinous or spiritous liquors on an individual, after having been long time deprived of them. Such an one is not to be at once liberally supplied, but must commence with their most moderate use. Mental operations also, through

the agency of the passions, will be found to influence the body as other stimuli. Take for example the operation of excessive grief or joy. The story of Joseph and his brethren presents us with a beautiful illustration. If the communication to Jacob by his sons that Joseph was yet alive had been made in a more circumstantial manner, had he been previously brought to see the asses and waggons which were loaded with rich presents for his use, his mind, perhaps, would not have sunk under the violent operation of hope and fear, and the too sudden transition from despondency to joy. For what scene which the imagination can picture, could have been more pathetic and touching than his subsequent interview at Goshen with this beloved child of his care. But here the way was wisely prepared to lessen his abundant excitability of mind, Judah had gone before to announce that Joseph was approaching. There is time for reflection. In their minds' eye already they have seen each other, they draw near, they meet and embrace. Joseph weeping falls on the neck of his aged parent, while he, receiving him to his bosom, calmly calls out, "let me die, since I have seen thy face, because thou art yet alive." Whether we adopt the idea of excess of excitability in cases of direct debility, or the opinion that there is not power to support great action when the system is for a long time deprived of the usual stimuli, it will not affect the truth and justness of Brown's fundamental proposition, as an important distinction to be applied in

practice, which is, that "the debility arising from defect of stimulus may be called direct, because it is not produced by any positive noxious power, but by subduction of the things necessary to support life." Take a subject who has been thus deprived of the things necessary to support life from birth, encounter him of a sudden with any of the stimuli habitual in common life, for example, ardent spirits, he will become intoxicated, perhaps to insanity; place before him the most luxurious viands, and the violent excitement which will follow in consequence of his abundant susceptibility to the action of every stimulant power, to which the system had not been habituated, would hurry that individual from a state of direct into indirect debility, and from that to a state which would terminate all action in death. In such a person, therefore, we experience that state of abundant excitability, which cannot be brought to the healthy excitement. It is only by slow degrees, and cautious, graduated measures, we can adjust the action and influence of stimuli. "A person that is frost bitten is not suddenly to be warmed, one that is famished is not immediately to be gratified with a full meal, excessive thirst is not directly to be encountered with copious draught, since life is solely the effect of stimulus," on the regulation of which, depend alike the vigor of the body or the energies of the mind.

The next inquiry which claims attention is on the doctrine of sedatives.

This term, *sedative*, is every day applied to a variety of substances, the operation of which on the human body is so different and opposite in different individuals, and in the same individual at different times, and under different circumstances, that like the term *natural*, it has become loose and indeterminate. Much periphrasis and dispute may perhaps be avoided by a definition of this term.

A sedative is defined "a power which diminishes the action of the heart and arteries, the energy of the brain and increases the excitability of the system.

In this view refrigerant applications, as cold and depletion, when applied to reduce the temperature of the body, check inflamation, or restrain arterial action, may be regarded as sedatives. The effects, however, of these articles is not permanent then, but variable according to the state of the animal's body. "To a part of the human body, as the hand, which has been exposed to water at a low temperature, tepid water feels hot; but if the hand be put into water of a higher temperature, tepid water then feels cold. The exposure to high temperature had rendered the hand more susceptible of the sensation of cold than it was before, and the low temperature had rendered the hand more susceptible of the sensation of heat." The immediate cause and condition of the animal's body is always then to be referred to, which, if duly considered will substantiate Brown's position, that "identity of effect always implies identity of cause." To illustrate, a vessel surrounded

by a freezing mixture contains much less calorique than the same vessel in an atmosphere as low as 60, yet the voluntary actions of an animal taken from that temperature and placed in a vessel surrounded by such a mixture are found to be much increased. Mr. Hunter ascertained that animals nearly torpid, became in such circumstances extremely active. The change, therefore, to a low temperature, though it have a tendency to produce sedative effects, by diminishing animal action; yet these effects will be found to vary as in the above case, by the sensation which the change from the low temperature of 60 to the freezing mixture had occasioned in the excitability of the animal. Hence the actions of the sytem may be increased by agents most powerfully sedative, which, under other circumstances, would have a totally opposite influence.* The effects, therefore, which are intended to be produced by the application of substances possessing the property of sedative, are not permanent qualities existing in such agents, from which uniform results ought always to follow, but relative qualities depending for identity of effect on the precise state and condition of the excitability of the animal at the time of their application, and whether that animal be in a state of direct or indirect debility.

* The application of cold, if at a degree not much below the natural temperature of the animal body, increases excitement, is stimulant carried to a high degree; it will exhaust excitability without producing increase of action or in other words is sedative.

Let us now inquire whether the sedative effects which result from the action of opium have not been blended with the cause producing those effects, by mistaking the condition which the action of opium has left behind for the action itself, the primary operation of which is always *stimulant*, and ought not to be confounded with the changes which arise in the state of the excitement.

One of the most striking experiments brought forward in support of the sedative effects of opium,is in a quotation of the illustrious Dr. Whytt from a thesis of Dr. Bard, de opio, which we shall here introduce.

"At 7 A. M. Dr. Bard took one gr. and a ½ of opium, his pulse beating 71 in a minute; at 8 A.M. his pulse beat 69; at 8¼ pulse beat 67; at 8½ pulse 66; 8¾ 66; at 9 64; at 9½ after breakfast, 66; at 10 65; at 11 61; at 11¼ 60; at 11½ 59; at 12 57; the lowest to which his pulse fell. Dr. Whytt insisted strongly on this experiment in favour of his opinion of the sedative power of opium." To put the point beyond doubt the following experiment was repeated on several subjects, with the assistance of the celebrated Dr. Goodwin and others.

Experiment 44th. Manchester Memoirs.

H.	M.	
12	5	Pulse 65: He took one grain of opium upon an empty stomach.
	10	Pulse not much altered.
	15	Pulse 70, and increased in strength.
	25	Pulse 76, and considerably more strong.

H.	M.	
	30	Pulse 76; pain of the head. Another grain was taken.
	35	Pulse 75.
	40	Pulse 76.
	45	Pulse 78; giddiness and confusion.
	50	Pulse 76.
	55	Pulse 76.
1	—	Pulse 75; another grain was given.
	5	Pulse 75.
	10	Pulse 75.
	15	Pulse still 75.
	20	Pulse 72.
	25	Pulse 72: Confusion, and a little giddiness.
	30	Pulse 72, and somewhat weaker. A fourth grain was taken.
	35	Pulse 72.
	40	Pulse 72: a degree of somnolency.
	45	Pulse 73.
	50	Pulse 74.
2	—	Pulse 72, and becoming more feeble.
	10	Pulse 69, and evidently more weak. Sleeps.
	20	Pulse 68.
	30	Pulse 64, very feeble.
	40	Pulse 58, and very irregular; beats sometimes not more than three times in five seconds, and sometimes it beat eight in five seconds.
	45	Waked affrighted: This agitation quickened the pulse: it beat at

H. M.

47 64.

50 Beat 62; no further observation was made upon it.

"The phenomena presented by these experiments, particularly the one introduced upon the pulse, shew that it had sunk in the space of an hour or thereabouts from the exhibition of the opium down to the natural standard or below it, after having been increased more than 10 pulsations in a minute." "Dr. Bard took the opium at 7 in the morning; he measured his pulse for the first time at 8, he then concluded that the state of his pulse at that hour was to be attributed to the primary effect of opium on the body." To determine the incorrectness of Dr. Bard's conclusion the following experiment was made with a solution of opium containing $\frac{1}{4}$ of a drachm to $\frac{1}{2}$ an ounce of water, upon the stomach of a young rabbit.

H. M.

"At 2 17 the heart beat 264.

20 pulse increased to 288.

30 fallen to 264.

35 animal in a state of inebriety.

37 animal convulsed.

39 convulsion which had remitted, returned.

40 animal died convulsed.

on examination after death the voluntary muscles had lost all excitability."

"Had the pulse in this experiment been omitted to be examined for the space of eighteen minutes, the conclusion which would then have been drawn would have been favorable to the opinion of Dr. Whytt, but would have been contrary to the fact, for the pulse previous to that period had risen more than 20 beats in a minute." For a more particular view of these facts and experiments on opium and other articles analagous in their operation, we refer the reader to Dr. Alexander's essay contained in the Manchester Memoirs, vol. 1st. in which it will be found that the analogy held good between stimulants and opium in every experiment. The conclusions we deduce are these, that opium in its primary operation is stimulant: that the stupor, dizziness, nausea, and vomiting which succeed to the use of this powerful stimulus arise from that state of indirect debility, which this, like all the diffusible stimuli, induces: "That the condition in which the system of the animals were left in all these experiments, so far from weakening the opinion in favor of the stimulant power, is the strongest proof in support of it." If, then, an equal quantity of the same substances which have once excited action in the system, are inadequate on a second exhibition to raise the action of the system to the same point, we may easily account why the same effects will not take place from a dose of opium to a patient laboring under a disease

by whom this article shall have been previously used, for the excitability which has once been exhausted by the employment of this or any other stimulus will require increased doses of that stimulus, in proportion as the system has become habituated to its action. The sedative effects of opium are to be found only in that diminished and exhausted state of the excitability, which uniformly results from the previous increased action of the heart and arteries.

But we are told that in case of cholic, when opium is usually given to remove the symptoms, Brunonians would answer, that it does so by stimulating the parts to so great a degree that they are no longer capable of being excited as before, because their powers to act and to feel are exhausted. If such an answer would be Brunonian, we must acknowledge our incapacity to find any authority for it.

Cholic is ranged in the class of asthenic diseases, arising from a defect of a just measure of excitement, in which increased but irregular motions in the parts to which the noxious exciting power is applied are kept up. Spasm and convulsions are likewise diseases equally to be imputed to debilitating powers. We are to confound those affections with that vigor of action which takes place in healthy excitement, no more than we should regard a female healthy and vigorous, who, in a fit of hysteria, may require the united efforts of many strong men to restrain her. We must be determined by observation and fact, and not by a superficial view of appearances. To a sub-

ject laboring under the diseases we have mentioned, we should apply stimulant remedies to remove the spasm, by which a due action is restored. In a person in health and strength, stimuli would produce the very diseases in question, by urging on a state of indirect debility. Spasm and convulsions, however strong, arise from debilitating powers; they are diseases of debility. The power of action in these cases does not correspond with that powerful action which is induced in a due healthy excitement exhibited in the muscular force of a vigorous man, for excitement means something more than simple contraction. Shall we be told, that after a paroxysm of fever or convulsion, because the subject in twelve hours can exert the body and mind with a vigor nearly equal to what they could have done before the disease began, that therefore debility does not accompany fever; that the excitement has been great, because in the one case arterial action was violent, and in the other the muscles have been violently contracted?

To return; cholic, as well as convulsion is a disease arising from and attended by debility, which is to be cured by a due adjustment of stimuli, and the removal of the noxious, exciting cause. If diseases of such character yield to opium, are we to suppose they do so by an operation which must be under these circumstances debilitating, and extinguish the miserable remains of nature's motions?

In a case of fever, producing violent arterial action, flushed countenance and great heat, we take away blood immediately, or very soon; the violent action is reduced, the heat lessens, the flush disappears. Here we have an instance of sedative effects resulting from the employment of a remedy which lessens excessive excitement by the removal of one cause by which that excitement was produced. In opisthotonos and lock jaw, opium is administered freely internally, and in some cases externally. By whatever latent operation these symptoms are induced, debility is the most striking feature which is presented in those morbid states of the body. If, says Brown, the functions seem very much increased, it is not owing to an increase of *excitement*, for the whole tendency of these diseases is from a begun to a gradual, total suspension of that well proportioned alternation between contraction and expansion of the fibre, on which true healthy excitement depends. For what end then do we administer opium in these cases? Is it for the purpose of lessening or increasing the powers of vitality? Is it not in short to promote action by its diffusible stimulus, relax spasm, and thus restore the regular motions of health to the afflicted subject? Is it then given in a case of cholic, tooth ache, or gout, to stimulate the parts to so great a degree that it shall exhaust all power to act or to feel, in other words, relieve the pain of disease by annihilating all excitability?

Opium, then, like all other stimuli used in moderate doses, will prove stimulant; in excessive doses, sedative; and cold moderately applied proves stimulant; applied to an excessive degree becomes the the most powerful of sedatives. Both of these operations will depend on the relative state of the animal excitability.*

We shall here terminate our observations on this head, by exhibiting some of the effects of opium, and point out its stimulant power in the removal of the symptoms of a late disease which has appeared in this commonwealth, called the spotted fever. They will shew that stimulant, not sedative, effects, are among the most remarkable for which this article is employed in medicine.

"A delicate female took more than a quart of French brandy in the course of eight hours, accompanied by a grain and a half of opium every two hours. At 11 o'clock, A. M. when this course was commenced she lay in a comatose state, cold and senseless, her skin dry, and the action in the radial artery so feeble, it was difficult to say whether the

* Though the qualities of substances be equally positive, their effects on the living animal will vary with the quantity applied. Cases occur, when opium produces sedative effects by "diminishing the action of the heart and arteries, and the energy of the brain. Do they furnish no arguments in favor of its sedative effects?" Does not the same condition result from the employment of any powerful stimulus? This is most fully established in the 10th, 11th, 12th, and 13th Experiments of the work to which we have alluded, and to which the reader is referred.

pulse beat or not; a constant hiccough was supposed to be the harbinger of approaching death. Wine and all the milder stimuli were rejected from her stomach as soon as they were taken, and each turn of puking seemed to bring her nearer to the grave. Brandy saturated with loaf sugar was resorted to. It staid upon the stomach, removed the hiccough, brought back the vital heat, unlocked the senses, and increased the energy of the pulse."*

A lady of delicate health in the county of Worcester, took three pints of brandy, and twenty grains of opium, during the first six hours of her attack, with the same disease; some of it was vomited up. No symptom of excessive stimulation supervened."

A great number of similar facts might be adduced, but it is time to proceed to the discussion of the remarks on the last proposition.

After giving an outline of the properties of the nerves and muscles, it is asked whether the other properties, such as digestion, and secretion, can be accounted for on any principles of mobility, irritability, or sensibility; or whether these account for those functions of the brain and nerves, by which impressions are made and communicated to the sensorium commune, and the various actions and reactions, sympathetic and associate, are produced? This point has already been considered.

Through the medium of the brain and nerves there is established a uniform consent, connexion,

* Strong on Spotted Fever.

and dependence of the various parts of the human system, in such manner that Dr. Brown supposed that as soon as the excitability was affected any where, it is affected every where, and that different parts cannot be in opposite states of excitement, but that the affection of a part might exceed that of the whole system in proportion as that part is made vivid and sensible. Hence a glass of wine or other cordial, when given to an exhausted person, will almost directly restore the full energies of both body and mind, of which they were a few moments previously deprived; and any painful cause operating on the brain, or the stomach, as the sudden relation to a person in high health of any distressing news, the violent seizure of the stomach by cramp or cholera, will weaken the excitement and produce a corresponding state in every part of the system. The same would result from any local injury, were every portion of the body equally possessed of the same susceptibility to excitement.

Will *philosophers* disprove this doctrine? Shall it be contended that during the excrutiating pain which accompanies a fit of opisthotonos, there is no increase in the frequency of the pulse? Shall we be told that sensibility is paralysed in the eye, the ear, and the tongue of the patient, because, in consequence of the morbid excitement under which he is laboring, he is regardless of objects, which, during such a state, are inadequate to excite the brain or the mind? If this proves any thing, it is

precisely that for which Brown contends, namely, that the excitability affected any where is affected every where, that no two organs can be in opposite states of excitement, for, as is well known, at the bed side of a subject tortured by spasm, all excitement is absorbed in the predominating one by which the distress is caused. How then can such a person be conscious of the friend at his bed side, of the cooling beverage he has offered him, or the tender accents he has sighed for his safety, whose brain and whole system of nerves are already under a superior excitement. *It is then absurd to suppose* it is confined to the seat of disease. It is carried from thence to the sensorium commune through every nerve of the body, the progress of thought is interrupted, and mental attention lost. The senses are impaired, and one morbid state of action occupies the whole frame; no other opposite excitement can take place, action in the seat of the disease may exceed that of the whole, only in proportion as it is most excited. Brown's system was intended by him to be accommodated to the entire animal. No local disease therefore could take place, he conceived, without more or less affecting the general state of excitement. He has not however excluded them from his consideration, he has omitted only to consider them except where by taking place the body did or might become generally diseased. He never looked in the "moon" for what was before his feet, or went "star-gazing" to determine the relative

states of excitement between the cases of a bloody nose and the bite of a mad dog.

The simplest wound will produce in some men *syncope*, in others a smile. The hero who undaunted will approach the cannon's mouth will faint at the sight of the surgeon's lancet, when the most delicate female will submit complacently to the painful and hazardous operations of his art.

Though the different individuals possess different susceptibilities to excitement, or by the power of habit may have overcome certain impressions, it does not follow that excitement is not one and the same thing over the whole system, that man like an electric body cannot be excited in one part without being excited in all, but that excitement in a living body having parts of different capacities to excitability, may be greater in some one part than in another, in proportion as that part is more easily acted upon by the exciting powers. This is the amount of Brown's theory, and does not go to an exclusion of local diseases from the regard of the physician. Brown's division of them in a general view, is simple, clear, and agreeable to the order in which they arise.

The remarks on the general propositions of the system we have examined. It remains for us to examine some general comments on these doctrines.

It is said they are not inferred from a sufficient number of facts. We ask in return, what constitutes a sufficient number of facts?

This system comprehends the first principles of medicine embodied in such form and order, that the intelligent student or physician is able to apply them, when called on, to the solution of the phenomena of disease; by which he may ascertain how far they agree or disagree, or are even analagous, and thereby discriminate appearances from realities,and not confound cause with effect, or be misguided by fallacious symptoms. It is a system calculated most of all to require the utmost care and attention in obtaining an accurate history of diseases, watching their course, and thus enable the practitioner more clearly to determine the cause of the complaint, and instead of prescribing to *names*, *secundum artem*, it prescribes to *realities*, secundum naturam et veram philosophiam.

"Have not the labours of the most indefatigable experimentalists already multiplied facts sufficiently to establish these general doctrines? Can we suppose by an increase of the catalogue we shall ever acquire a knowledge of primary causes. Is there any reasonable expectation these philosophers will arrive at the discovery of elementary principles by the aid of multiplying instruments and experiments, with any greater certainty than our ancestors, who, by the light of reason and facts, abundant and common, sought in vain the desirable end?" We have in truth facts enough already. Our lamps want trimming more than oil. If this system does not account for all the various phenomena of health and disease, it contains standard rules which exist in

nature equally certain with facts, and which, rightly applied, will enable the accurate eye of the laborious investigator to point out differences and variations which may arise, ascertain their relative distinctions, as regards either their force or their violence. It is true the consideration of the power of habit in controling alike the physical and moral man, Brown left, as he assures us, to a future occasion, but he did not survive to enjoy it.

An attentive perusal of these doctrines will satisfy an unprejudiced mind, that his method of reasoning was not altogether founded on the ancient synthetical plan; more than twenty years of his life were spent in the study of medicine, and in attention to the forms and varieties of disease, discussions on the theory of the art he was constantly engaged in, while he was as often employed in witnessing the application of principles to practice. At length he burst asunder the fetters with which the authority of the schools had restrained his intellectual powers, exciting the attention and stimulating the zeal of almost every medical school in Europe. The result has been important. Neither the imperfections of Brown, the incapacity exhibited in misconceiving his system, nor the absurdities displayed in misrepresenting its tendency, have as yet darkened his fame.

He lived at a period when medicine had begun to assume a new face. The Hunters, Whytts, and Fordyces, were luminaries from whom he lighted up the fire of his original mind. "Does there no gen-

eral disreputation attach to us for our faith, whether we follow Cullen or Brown?" Why then shall we call on Tyros or Professors to join in deprecating the work of a man "who dared to raise his voice against the fashion of a day however respectable."

"Quid mihi Celsus agit? monitus, multumque monendus
Privatas ut quærat opes, et tangere vitet
Scripta Palatinus quæcunq; recepit Apollo."

Horace, Lib. i. *Epist.* 3d.

"Brunonians will not imitate the stupidity of the disciples of ancient philosophers, nor become the dupes of modern ones, but exercise their reason in expunging, adding, or correcting, as experience shall dictate." Practice must, in the very nature of things, in all ages have preceded theory. Theories in medicine have long existed, but what has been proof in one age has not been considered so in another. This is the fate of human investigation.

Analysis and the multiplying of facts, seem in our day to claim chiefly the philosopher's regard. Far be it from us to decry their importance, but it behoves us to beware, lest the increasing mania for experimenting, should tend only to enlarge our stock of facts without extending the sphere of improvement, which is as much to be sought in the analysis of our sensations, as in the objects producing those sensations. To acquire a just theory, reason and experiment must be blended. "Both of these paths of inquiry proceeding from one middle

point, sensation, and meeting those, form a connected whole, whose parts mutually conspire to its perfection and to each other's support." The general propositions of Brown's system, like the Principia of Sir Isaac Newton, are not, nor can be facts, but reasoning drawn from facts, or the analysis of appearances. If in his lectures he was sometimes chargeable with "frantic prelections and bold assertions," let it be remembered, genius may be pardoned for what dulness was never guilty of.

If Brown has described little more than a hidden property, the author of the "Remarks" has indeed one source of self gratulation in his rival description of an "inherent faculty." If these doctrines in the hands of some men, who seek to acquire money and fame, without aiming to extend the boundaries of medical science, have been applied to the base purposes of quackery; we have to deplore with humanity that ignorance and incapacity are permitted by any government which deserves that name, to practise an art which should be restricted within the province of elevated minds, founded on the basis of solid learning, and subjected to the strong arm of the law.

To conclude, it is not attempted in the "Remarks" we have examined, to show, that Brown's system bears no relation to truth, but that, to the *opticks* of the *author* the foundation is not solid, and of course it is not necessary to examine the superstructure. We do not flatter ourselves to change

opinions founded on early and fixed impressions. We would suggest our belief, that any mind, anxious for medical improvement, would be more likely to accomplish this great object, in evincing a greater zeal to amend than severity to deprecate. For if we admit the truth of John Hunter's maxim, "that to increase action is not necessarily to increase power or vigor," we establish a principal support to the superstructure of Brown's system.

Let it not however be supposed that medical science has nothing left to future improvement. The field of medicine is wide and extensive, its enclosures are rich and luxuriant. Let not our eye ache with the waste which lies beyond it; but with energy and delight let us cultivate and enjoy the fruits it affords.

"All knowledge is relative, even Newtonianism* may be reformed. What glorious advances posterity may have in store we know not. But ardent should be our hopes and indefatigable our zeal. We ought to press forward and not imagine the labors of one man can have bounded our progress, or hearken to those, who, having erected an idolatrous

* The immortal *Laplace* has acquired as much fame in detecting the errors blended with the truths in the Newtonian system, and in obviating all the difficulties originating in the incorrect hypotheses of the English philosopher, as had Newton himself from the discovery of gravitation, and the application of that doctrine to the solution of the phenomena of motion in the heavenly bodies.

temple to his fame, would have us stop and worship; nor presume to pass the boundaries marked out to human reason."

FINIS.