

**Criticisms and controversies relating to the nervous and muscular systems
/ by Bennet Dowler.**

Contributors

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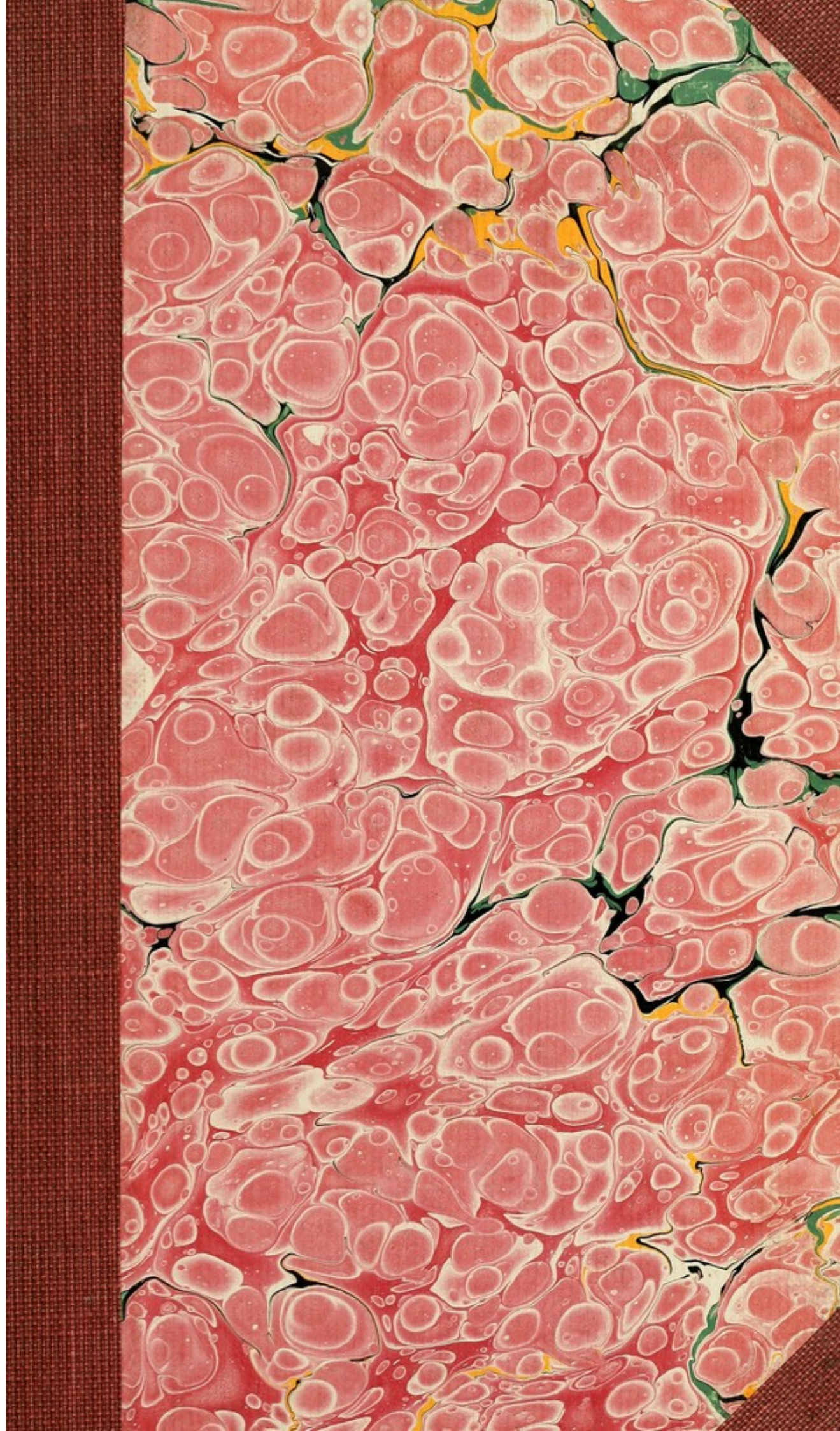
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CRITICISMS AND CONTROVERSIES
RELATING TO THE
NERVOUS AND MUSCULAR
SYSTEMS.

BY BENNET DOWLER, M. D.,

OF NEW ORLEANS.

Reprinted from the New Orleans Medical and Surgical Journal, September, 1847.



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JOSEPH COHN, PRINTER, CORNER POYDRAS & TCHOUPITOULAS STS.

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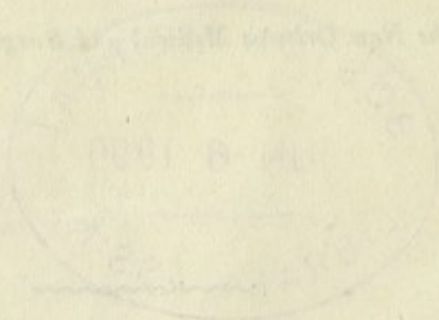
VEGETABLE AND MINERAL

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It is impossible to separate the controversial, from the scientific portion of this paper. Whatever the reader may think of the former, he cannot but regard the latter as relating to a subject of great interest, especially at the present moment. If great errors have been assented to as great truths—if deceptive experiments have been relied on to establish principles, which can have no scientific, or even possible connection as cause and effect—if dangerous analogism has replaced exact knowledge and pertinent observation—if hypothetical and “mysterious” assumptions are henceforth to constitute the only foundations of the nervous system or neurology, including nearly the entire circle of the medical sciences, surely it is a most reasonable thing to scrutinize without delay the fundamental principles of medical belief.

The warlike aspect recently assumed by the goddess of neurology, is without parallel. Opposition to the reflex-hypothesis has been repeatedly denounced within a few months, by some of the foreign medical journals, as “calumny, cowardice, consummate meanness, damning crime,”—nay, more, Providence itself has been invoked—prophecies have been uttered;—the *Lancet* prophesieth, concerning the rejecters of Dr. Hall’s reflex doctrine on this wise: “We venture to prophesy, that posterity will take ample revenge upon the present race of laggards and obstructors in the way of truth;” it affirms also, that among the Royal Society there is *but one* man who *understands* this doctrine, namely, Dr. Hall himself;—“there is not *another Fellow* within the College who thoroughly comprehends the advance which has been made in the physiology of the nervous system.”*

War is a necessary evil, dangerous it may be to the combatants, but often beneficial to the public. The passions die,—truth lives. If any real conquests be made, posterity will reap the benefit.

* Dec., 1846, Amer. Ed.

I regret for the reader's sake, as well as for my own, that any personal matters should have a place in this paper, but as this is unavoidable, it is hoped that he will be more than compensated for this evil, by scientific references, facts, and illustrations from different points of the medical compass, shedding a degree of light on some of the dim paths in the tangled forest of physiology.

Content with the approval, the encouragement, the generous efforts to disseminate my researches, hitherto extended to me in Boston, New York, Philadelphia, Louisville, Lexington, Charleston, New Orleans, and elsewhere, I had determined not to reply to foreigners—not even to Dr. Hall, whose communication in the *New York Journal of Medicine* for January, of the current year, though restricted to eight lines, is marvelously exuberant with animosity, nay, it is positively belligerent. It is intended in another part of this paper, to take a slight observation on his parallax in the neurological heavens. There is, indeed, no necessity that I should return railing for railing, were I so inclined.—The retribution of his own countrymen is coming apace.”*

About midsummer, a medical gentleman of New Orleans, called my attention to the *Medico-Chirurgical Review* for April of the current year, in which I found an attack upon myself, implicating my American friends,—an attack in which that journal has greatly departed from its accustomed rules of sound criticism. My determination was now changed. It seemed due to truth—due to the distinguished American critics, who with scarcely a dissenting voice, had pronounced in favor of the originality of my experiments on muscular contractility—due to myself, to attempt a reply. Two methods presented themselves;—first, to publish the residue of my experiments, with a generalized view of the whole, leaving my trans-Atlantic critics to their own consciences, and to the soothing influences of time. But, then, if fifty cases will not convince unbelievers, neither will one hundred. I therefore determined to adopt the only remaining method, that is, to meet my opponents in their own way, to abandon things for words, experiments for logical abstractions, entities for theories, with, however, an occasional *fact*, the ponderosity of which might serve to keep the controversy from flying beyond the influence of gravitation and materialism; for, it will be seen, that the neurologists have entered their protest against “material studies.”—The *Lancet* maintains that, while Dr. Hall's discovery of the true spinal marrow is destined to revolutionize to a great extent physiology and pathology, and to alter our ideas of the action of remedies,† a “reason of its tardy reception,” “is the material studies of medical men,” as,

† “Dr. Hall's conduct to other physiologists, his predecessors and cotemporaries, abundantly manifests that no reliance whatever ought to be placed on his assertions where his vanity is concerned, and how seldom is it not!

“In sober earnestness, indeed, we think it impossible to contemplate Dr. Hall's actual position in the estimation and regard of his cotemporaries and fellow-laborers in science, without compassionate sympathy which is at once melancholy and distressing; he lives the very Pariah of the physiological caste, the Ishmael of a desert created and sought out by himself, with his hand against every man, and ever man's hand against him.”—(*The British and Foreign Medical Review*. London, January, 1847.)

† Lond. Lanc., Nov., 1846.

“humoralism, morbid anatomy, and organic chemistry,” “all material in their objects, rendering men’s minds inept to the study of phenomena and laws of action of a vital force or *imponderable, such as the excitomotor-power.*”^{*} In plain English, the experiments, scalpels, “*true spinal marrows,*” frogs, tortoises, salamanders, ARE IMMATERIALITIES, invisible, incompressible, undilatable, inelastic, formless, unextended,—and all the changes in morbid anatomy, as induration, softening, brittleness, color, form, size, weight, vascularity, tuberculization, ulceration, gangrene, and so forth, ARE IMMATERIAL. The new school builds its immaterial, imponderable system, upon the grossest materialism—not on Pantheistic Materialism, but on frogs and the like; a few obscure *material phenomena* from *these*, on being transferred to *man*, become *immaterial*, and in their action, according to Dr. Hall, “as definite as the ordinary ray.”

Unfortunately for neurological neophytes, no *immaterial, imponderable standards*, weights, measures, and tests have as yet been revealed. In this critical state of things, and as a prelude to some remarks in the sequel, a passage from Goethe’s Faust, is deemed worthy of consideration:

DOGMATIST.—I will not be put out of my opinion not by either critics or doubts. The devil though must be something; for how else could there be devils?

IDEALIST.—Phantasy, this once is really too masterful in my mind.

REALIST.—Entity is a regular plague to me, and cannot but vex me much. I stand here for the first time, not firm upon my feet.

SUPERNATURALIST.—I am greatly pleased at being here, I am delighted with these; for, from *devils* [frogs,] “I can certainly *draw conclusions as to good spirits*” [men.]

The peculiar advantage in this kind of warfare is, that it can be prolonged *ad infinitum* without the danger of whipping or being whipped, and in many cases without the remotest probability of coming to any satisfactory conclusion whatever. A whipping *de facto*, that is by experiments, is a materializing process, a regular entity, a species of realism, unfriendly to the soarings of the Ideal, in logical speculations. No fact in the history of the human mind is more extraordinary, and at the same time more instructive, than that *bias*, shown by even great men, to attack the very foundations of knowledge. Berkeley’s arguments in disproof of the existence of matter, have not been yet fairly answered, it is supposed, by even Dr. Reid. The Ideal is a regular and most worthy entity with many.

Schiller, in his *Æsthetic* letters, says, “chained to the Material, man is all his time only serving his own designs, before he allows to show a special personality in the art of the Ideal. He requires for the last a total revolution in his whole mode of perception, without which he would never find himself *on the way* to the Ideal.”

Far be it from me to say a word in depreciation of the transcendent value of neurological knowledge. The brain, its spinal prolongation, the individual nerves, constitute a central sun, which illuminates and controls several minor systems, which would otherwise roll on in cheer-

* *Ib.* Dec., 1846.

less obscurity. The senses themselves, those inlets of knowledge, psychology, the doctrine of the mind, many morbid changes and healthful actions, vital functions and anatomical relations, have been not only elucidated, but to a great extent referred to their appropriate laws,—not indeed, by theories in themselves as inconceivably *obscure* as are the phenomena whence they are illegitimately derived, under the denaturalizing vivisections of the inferior animals, not by meaningless tremors, vibrations and convulsions in the muscles from irritating the spinal roots, and thence generalizing almost without limit,—not by localizing and isolating the functional phenomena (with a precision unknown even to phrenologists,) to a mathematical point or figure, in some root or ganglion in the anterior peduncles of the cerebellum, or the thalami nervorum opticorum, as the special residence of the great All or the Me of neurology. Anatomy itself, to which Bell finally gave in his adhesion, is not the only route to be pursued; for strictly, there is not one neurological doctrine, which *à priori* is determinable from mere structure, from any aggregation or configuration of nervous atoms;—here even analogy is as voiceless as the dead. Neither the sense of taste, nor the sense of smell can be inferred from any nerve-structure alone. Indeed, the whole material world, is up in arms with analogies *against* this view as countenancing the fundamental doctrine of Bell, Hall, and many others, who ascribe motor *force* to the nerves only. It is possible to conceive that the muscles and bones, even the skin and the membranes, from their mechanism, might be endowed with force, motion, and the like, but as for the nervous matter, it has not from its very organization, a much greater pretension in that direction than the blood itself. Analogy (not a very convincing kind of proof, it must be confessed,) is against this assumed, exclusive moving power as inherent in the nerve. Do men make ropes of sand, or levers of water? The method adopted by the reflex neurologists to show that the muscular force, is merely a derivative one from the nerves, is inconclusive, nay absolutely erroneous as I have fully proved by adopting their own point of departure. The destruction of the spinal cord, the division of every discernible nerve and all the muscles not concerned in the special functional act intended to be performed, do not in the human subject even diminish the intensity or duration of muscular contractions.—do not prevent regular, and I might say intelligent flexions and extensions to which the spinal methods can make no pretensions.

The reflex neurologists who are not partisans, feel that the ground is constantly sliding from beneath their feet. Clear as “Euclid, definite as the ordinary ray,” are expressions which they never use. They can scarcely regard their theory as rising beyond a probability, or provisional admission.

The editor of Documents on the modern Discoveries in the Nervous System, sums up, albeit doubtingly, thus,—“under these circumstances of *indiscision* and *doubt* as to *past experiments*—of parts *different* in nature manifesting *similar* results, is this fundamental question *again thrown open to discussion*. Nerves directly opposed in their nature as the spinal roots are supposed to be, on irritation, yield results which are more or less similar, *instead of being precisely opposite*. The character, too, of the motions occasioned by such experiments, appears in no way

to resemble that of the *calm* and *deliberate acts* induced by impressions on the organ of touch, but that of involuntary and irresistible *spasm*.—It seems not improbable, therefore, that the immediate subject of these experiments has *not hitherto been understood*—“so as to derive from them *any satisfactory information*.”*

The editor of the *Medico-Chirurgical Review*, convinced that some explanation of my experiments must be given, otherwise Bell and Hall's discoveries as founded on spinal experiments upon the inferior animals must disappear forever, (the first discovery, Harvey's being perfectly safe from any foreign flag,) offers one so essentially absurd as to defy competition. To see by means of the finger, toe, or stomach, at every possible angle, and through the opaque earth, to maintain that a dose of quinine or arsenic grows stronger the more it is divided—to maintain with the Reviewer that the physiology of a reptile is essentially that of man—are mere truisms in comparison with the following: “The *cause* of the contractions above described, [by Dr. Dowler,] and similar instances which occurred in this country during the prevalence of the cholera, is doubtless the *rigor mortis*, and is, therefore, independent of the nervous centres. Such is the conclusion of the author.” Now this conclusion is not only as absurd as any conclusion ever was, but is directly opposed to all my published statements. The *rigor mortis* the *cause* of muscular contraction!

I might here ask, by what principle of plain-dealing physiology or of common sense, can Bell and Hall's *denaturalizing* experiments, with galvanic and instrumental irritations upon the spinal roots, of dying and dead frogs, &c., *be good* for the explanation of *human* physiology, pathology, practice, medicinal agents, obstetrics, clear as “Euclid,” “definite as the ordinary ray,” a mere incarnation of exact science,—how comes it that unmeaning, “convulsed, tremulous” actions upon such animals constitute “*the most important discovery*,” while, from the same point of departure, regular, definite, prolonged, functional flexions and extensions produced on *man*, *without galvanism*, *without the spinal marrow*, *without any discernible nerve left undivided*, must go for *nothing*; prove *nothing*, but the *rigor mortis*! As a mad-doctor might never hear anything equal to this in the mad-house, it may deserve a little attention like any other monstrosity. If this be physiology, “the American professional mind,” is, as the editor fears, ignorant enough.

To be obliged to define the simplest words, and to prove self-evident truths, is as lamentable as it is difficult—difficult, because no terms remain so clear as the very matter to be explained. There is, however, no alternative. It is my misfortune to have a critic who requires this sacrifice. I ask the commiseration of all charitable Æsculapians, and the more so, as “definitions which throw light on some things, cause darkness in others.”

ΡΙΓΟΣ, RIGOR, *stiff, unbending, inflexible*. “RIGOR MORTIS, *stiffness of death*. The rigidity of the limbs that occurs in dissolution.”†

* 3. Lond., 1839.

† Dunlison's Med. Dict., 1846.

“Cadaverous *stiffness* is a constant phenomenon, and is characterized by the *firmness* of the soft parts and the *resistance* and *immobility* of the articulations.”*

“The *rigor mortis* is due to a particular state of the muscles, ensues at a certain period after death,—never later than ten hours, and after a time ceases.”†

“The action of *real* death is that which takes place in the *stiffening* of the body, and until then it is not dead.”‡

“When muscular *irritability* ceases, *cadaveric rigidity* sets in; it is the first certain evidence of death. *The body may be lifted like a plank.*”§

M. LOUIS in a letter to myself, says that the *rigor mortis* is one of the most certain signs of death—“*la roideur cadavérique une des signes le plus certains de la mort.*”

Finally my own authority, is, at least in this particular, good for something, as it is the result of many prolonged observations. I will quote from the essay which the Reviewer had before him when he penned the “CONCLUSION” that “the CAUSE of the muscular contractions described [by Dr. Dowler] IS DOUBTLESS THE RIGOR MORTIS.” In pages 32, and 20, it is said,

“Every dissector sees in the relaxation or flexibility which *follows cadaverous stiffness*, the *first* step towards putrefaction.” “*Sometimes, post-mortem rigidity* sets in during the *paroxysm of contraction*, producing a very singular phenomenon,—a hard mass, which continuing for hours, feels like bone. I have known this to be mistaken for a fracture badly set, or for a bony tumor.” Again, “*rigidity prevented flexion.*” In a few cases the *rigor mortis* appeared to be *wholly wanting*, at least for many hours, that is as long as observed; in some it was very transient, but in *none* was *contractility* observed during the *flexibility* which follows *rigidity*;—in *no case* could any appropriate *contraction*, as flexion of the forearm be effected *during the action of the RIGOR MORTIS*; but, in those very rare cases wherein *no rigidity* perhaps ever occurred, *contractility* existed. I recollect one case, (though I have not now time to search for it in XVII. vols. MS.,) where in the woman’s body was every where flexible,—even the muscles of the neck, where rigidity usually begins were as limber as in complete syncope, while, for hours, the flexors of the arm contracted vigorously, when struck with the edge of my hand, lifting a hatchet weighing about three pounds from the floor to the breast. But, for the most part *strong contractility* is the fore-runner of *strong rigidity*. Contractility is dynamic, rigidity static. Antagonists are they. Nay, they differ more than motion and rest, being in fact both physical and physiological *contraries*, but never related as *cause* and *effect*.—Mr. Hume defines “a cause to be an object followed by another, where all the objects similar to the first, are followed by objects similar to the second; or in other words, where, if the first object had not been, the second had never existed.” According to the Reviewer, muscular contraction can never take place, until after the *rigor mortis* sets in, as the effect cannot precede its cause or antecedent. The body must be per-

* Beclard, Gen. Anat. 108. † Müller, Phys. 656 ‡ Hunter’s Lect. c. ii.

§ Guy and Lee, Med. Juris. 381. In a few particulars, not material to the matter under consideration, I dissent from these authorities.

fectly stiff, to be perfectly limber. The greater the rigidity, (the cause) the greater the effect (contraction), that is, a cadaver so inflexible that a limb cannot be bent without severing the muscles, is at the same time capable of performing repeated, prolonged, regular functional motions, as extensions, flexions, &c. To use the language of the Reviewer, somewhat differently applied, "if the publication of these views be the result of any peculiar importance attached to them on the other side of the Atlantic, we fear that modern physiology has not penetrated very deeply into the [European] professional mind." Is the Reviewer altogether competent for the responsible office of deciding upon the scientific claims and rights of cotemporaries? Years of toil, the long watchings of the mouldering cadavera, facts gathered by actual observation, experiments repeated from time to time along the frontiers of death, because they do not favor the theories of the Reviewer, are at the small expense of a little ink, blotted out, or misrepresented without an attempt to test their truth, or study their import. A physician of New Orleans, observes several thousand physical phenomena, and publishes about fifty individual histories;* an editor in London, closeted among the classics, seeks not the *thing* but the *word*—RIGOR MORRIS. This is literally following the advice of the devil (Mephistopheles) to the medical student, in Faust, and is directly in point:

"MEPH. A fine *word* will stand you instead. Attend but one master and swear by his *words*. Generally speaking *stick to words*; you will then pass through the safe gate into the temple of certainty.

STUDENT. But there must be some *meaning* connected with the *word*.

M. Right! only we must not be too anxious about *that*; for it is precisely where the *meaning fails* that a *word* comes in most *opportunately*. Disputes may be admirably carried on with *words*; *words* form a capital subject for *belief*; a *word* admits not an *iota* being taken from it. * * * The spirit of medicine is easy to be caught; you study—and let things go on in the end—as it pleases God." But if there be any devil in London, he never would have advised the term, *rigor mortis* as explanatory of the *cause of muscular contraction*, inasmuch, as this would but compromise his understanding without any necessity, seeing that the excito-motory-reflexians have already, a vocabulary not to be surpassed in obscurity, puzzling to the devil, and rivaling the Choctaw. *Rigor mortis* is a plain word, with but one meaning,—represents but one idea. "Falsehood, says Locke, is the joining of *names otherwise than their ideas agree*."

Logic is as dangerous as gunpowder in careless hands. At one moment the Reviewer determines to foreclose the question of originality; and with that view, he exclaims, all Europe knew this before!—At the next moment, wishing to use the argument of authority, he says, all Europe is arrayed against you! Can any one resist the *vis inertia* of "the European professional mind?" Now the argument of authority, is only good where opinion is to be weighed against opinion, but, good for nothing when opinion is to be opposed to fact.

* Some of these were published in the West. Jour. Medicine, April, 1843.

The Reviewer has, however, made an attack upon one fact, that I had incautiously admitted, but not as an observation of my own; for to tell the truth, I was misled, if at all, by "the European professional mind," and this I regret the more, as it is, however true, wholly immaterial to my argument, and must have been intended as a quotation. I hold the fact in abeyance, nay, I abdicate it without mental reservation, *as non est inventus*; I give it up to the experimentalizing wizzards, that they may throw it into their cauldron once more,

"With adder's fork, and blind worm's sting,
Lizzard's leg, and owlet's wing."

It is, however, proper to show that I have the highest European authority for the fact. I will put the editor of the Medico-Chirurgical Review in one scale, and the Professor of Natural History, of the Royal College of Henry IV, Paris, in the other,—authority against authority.

REVIEWER :

"In further illustration, the author, [Dr. Dowler,] invokes the supposed fact that 'an earth-worm may be cut into several pieces, and that each portion becomes a perfect animal.' No one acquainted with the structure of this annelide and with the laws of development, could *imagine* such a departure from the principles of formation; but for the information of Dr. Dowler, we may state that, by numerous experiments made some years ago, we ascertained that no portion of the earth-worm severed from the head, however large, survived beyond a limited period, dependent upon the length of the segment: the part so detached dies ring by ring."

H. MILNE EDWARDS :

The lubricus terrestris or earth-worm.

"If we examine the disposition of these different sets of apparatus, which concur, each in a different manner to the support of life, we shall find that they extend uniformly from one extremity of the body to the other, and that each transverse segment of the animal differs but little, or not at all, from the others; it is a constant repetition, includes all the organs necessary to vital movement. If an earth-worm be cut transversely into two, three, ten, or twenty pieces, *each of its fragments may continue to live as a whole*, and to constitute a *new individual*." (*Anat. and Phys.* 15. Translated by Dr. Lane. Boston, 1841.)

The Reviewer quotes the following passage, (in brackets,) from my essay: ["The reflex school maintains, not only that the integrity of the spinal cord is indispensable to transmission, but that the division of the anterior roots is a complete barrier to muscular motion. This doctrine is not based on the healthy living body. It is not, with a few obscure and unimportant exceptions deduced from morbid conditions, but from the last agony, and more than all, from the recently dead state of the inferior animals—a kind of proof by no means satisfactory. It should never be forgotten that experiments on the inferior animals, as frogs and turtles, are inconclusive in establishing the complicated physiology of man:"]—whereupon the reviewer remarks: "It is difficult to conceive, with the evidence possessed upon the points here referred to, how this passage could have been penned. What, it may be asked, are the phenomena displayed in the anencephalus infant that

survives its birth? It breathes, it cries, it sucks, it discharges the excreta of the body. How, we would ask of the author, are these complex, associated movements performed? Do they involve any nervous agency?—if so, what is the part implicated? Brain there is none; and we may presume that even Dr. Dowler would not attribute either to the nerves or the great sympathetic, the power of originating and combining in functional action, muscles so numerous and remote as those engaged in the functions named. What other conclusion remains, but that the spinal cord is the necessary and active centre.”*

The fairness with which I have laid down the reflex doctrine of transmission, the supposed essentialism of the spinal cord as the agent of muscular action, no candid man who really knows anything of the matter, anything of the writings of Dr. Hall, and the entire school of Philo-Hallians, will deny. The present paper demonstrates that;—but, if a doubt remain, the numerous volumes of the *Medico-Chirurgical Review*, for a quarter of a century, will show that I understand, and quote Bell and Hall truly. Let the present editor read that valuable work upon that point, together with Æsop’s Fable of the Belly and the Members, in which he will learn that coalitions for or against any one organ exclusively, even the *true* spinal marrow, is bad physiology. The brain is good. The heart is good. The muscular system, as well as the spinal cord is good. The controversy against “the Belly was kept up as long as any thing of that kind can be kept, which was until each of the rebel members pined away to the skin and bone,—the hands wouldn’t work, the teeth refused to chew, &c. Then they found there was no doing without the Belly, and that he contributed as much to the maintenance and welfare of all the other parts as they did to his.” Robert Whytt knew something of this. But he called it sympathy,—a remarkable consent of parts, and so on. I have no doubt that the Reviewer’s *brainless* babies missed their brains very much; had their “true spinal cords been withdrawn gently,” (as Dr. Hall would say,) their breathings, cryings, and excretings would have been damaged, and still more, had their hearts been “gently extracted.” What then? What other conclusion remains says the critic, but that the spinal cord is the necessary and active centre? forgetting the “Belly,” and even the heart! forgetting the mutual dependence and modifications of associated organs.

* This unfortunate, reported by M. Lallemand, lived only three days. Its movements were not energetic. Dr. Hall, and the *ci-devant* Reviewer, many years ago, had worked this monstrosity into spinal capital. The interpretation in 1834, is reiterated in 1847, namely: “It must be obvious that the muscular motions in this instance *must* have been the result of impressions *transmitted* from the nerves to the medulla, and of actions impressed by the medulla on the muscles”—a very *reflexive* explanation. For, if the *sucking impression began* in the mouth, it had little to do to travel down into the spinal marrow, and back, for *nothing*, seeing that in such an emergency the *inherent* sucking power was already in the muscles of the mouth. A back-woodsman on being asked for an explanation of the word *disembogue*, defined it satisfactorily to himself and interrogator, thus: “You disembogue me, and then I will disembogue you.” The mouth and spinal marrow mutually mystify each other, and if there be any thing in the decalogue, requiring us to explain *every thing*, I propose to give the mouth the preference, and hush the matter up.

If logic chopping were allowable, I would adopt the Reviewer's method, and ask, "what other conclusion remains but that the muscles are the necessary organs in sucking, crying, and defecating? Allow the anencephalus infant, a brain, a spinal marrow, a perfect nervous system, and every other organ in the most perfect state, and allow at the same time that, by some freak of nature, the muscles are wanting in their attachments, either at their origins or insertions, then of breathing, crying, and sucking there will be none, of complex associated movements there will be none, and of the Reviewer's exclusive spinal arguments there will be none.* The argument is altogether in my favor, and more than all the experimental proof is mine, beyond question. I have proved that in New Orleans, dead men and women from the icy circle to the torrid zone,—after cutting off the connections with the spinal marrow,—after amputating the shoulder so as not to injure the muscles of the arm, after dividing all the discernible vessels, and nerves, and tissues, except the individual muscles to be called into action, can perform during many hours, definite functional motions, not the tremulous, convulsed, and therefore, unmeaning motions, which from Haller to Bell, have been vaguely referred to irritability, but the elementary or simple motions from which are compounded all the varied actions of the living man! The two muscles which bend the forearm for anatomical simplicity, and still more for the enormous mechanical leverage which they overcome,† when a weight is placed in the palm, are the most convenient for experimental purposes.

I have, as it were, insulated the muscular force, and have noted, very imperfectly I admit, its isolated phenomena, shown its periodicity, its fits of action, duration, direction, exhaustion, extinction, its times, velocities, its decreasing ratios from increasing times, from repeated efforts, and from augmenting weights; nay, more, that it may, in a certain sense, be weighed, that is, exactly counterbalanced by the gravitating force of pounds and ounces. I will not say that I have proved positively, THE EXISTENCE OF AN IMMATERIAL ENTITY, OR FORCE IN THE MUSCLE, but, I may say, that I have offered some presumptive proof to that effect. Omitting that immaterial, psychological entity, the soul, where is there so much proof, so many tests, going to show in any other tissue of the body, a force, possibly immaterial, and isolated, possessing so many properties, and which can be approached by so many methods, avenues, and tests? Inaccessible until after death, this force, whatever may have been its complications and dependencies during life, shows an utter independence of the spinal marrow, as well as of the entire nervous

* "That motions peculiar to life can exist without the accompaniment of *brain and nerves*, is proved by the existence of those animals which are destitute of them." (Blane's Med. Logic, 121, Amer. Ed.)

Even Bell, admits "that animals, without possessing nervous cords, are susceptible of the impressions and of the reactions necessary to their existence." (Anat. and Phys. 11, 51. Am. Ed.)

† Bonelli states that the whole force expended by the muscles of the arm, when stretched horizontally, is 209 times greater than that of any weight suspended at its extremity, and that the force of the biceps, compared with that of brachialis, is as 3 to 2.60, or as 15 to 13, and their absolute forces 300 to 260 lbs. (*Lancet*, May, 1846.)

system. The brain, the spinal marrow, the nerves, under similar circumstances, appear as so much inert matter, without force, without function, without any apparent vital phenomena whatever, actually dead, and in the strongest contrast to their high functions in life, as the instruments of the mind, of sensation and of some of the principal vital phenomena. But there is a constant bias to assumption, and to be satisfied with the minimum of evidence in neurological doctrines, and the more so, as the subject is obscure; the mind yields to a flattering illusion rather than confess ignorance.

How brainless infants contrive to cry, suck, and excrete, I will not tell the Reviewer, because I do not know. But this I know, that if Reflexians fix as the point of departure, the morphological type, unmeaning experiments upon the spinal marrow of the inferior animals, under denaturalizing processes, and thence proceed by analogizing speculations, to appropriate to their theory the encyclopædia of medical science, not excepting "all the emotions, appetites, and passions," surely, experiments upon the human subject, must be far more conclusive and comprehensive, and were they applied in the same latitudinarian manner, nothing would be left for future discovery; muscular motion would be to the organic, what gravitation is to the inorganic world, and the physiological mechanism would be like the celestial, but a matter of calculation, an estimate of simple and compound forces and velocities. Until then a mystery will hang over the physiology of the "anencephalus infant," which in the mean time, will deserve all the compassion expressed by an old poet,—

"Ill fated youth! what stars malignant shed
Their baleful influence o'er thy *brainless head*."

Upon the whole, it is evident that my experimental researches are not acceptable to the Reviewer, because they disprove that which the Medico-Chirurgical Review had so often proclaimed as a discovery, as the fundamental principles of his distinguished countryman, and of medical science, as if Bell and truth were synonymes. The *naïveté* with which this is set forth, is admirable: "we have no wish, however, to affirm that these observations are devoid of interest; nor that, *if published as illustrative of a somewhat obscure class of phenomena* connected with muscular action, they would have been uninteresting; but considered as the lever by which the magnificent superstructure of *modern neurology* is to be *overturned*, we hold them to be most vain and futile." Now by "modern neurology" the Reviewer means Bellism and Hallism, as taught by experiments on frogs and the like,—animals which he has pronounced "essentially like man!" My experiments and arguments, do not in the least conflict with, much less pretend to "overthrow the magnificent superstructure of neurology," or any portion thereof, except the erroneous. "But *if they had been published*" to confirm Bellism and the exaggerated estimates of the same, in the Medico-Chirurgical Review, they would probably have been unqualifiedly "interesting and instructive!" Is the Reviewer a better neurologist than I am, because he believes more errors? Is he aware that Bell is nearly as great a skeptic in his *own* discovery, as founded on experiment, as I am? Bell, the critic loves well, but not wisely, as is easily proved.

He swears by Bell's words, and by Bell shall he be judged, for the blunder has been growing many years! Here, the Review is authority.

It will be borne in mind, that the muscular motions in the inferior animals which Bell describes, upon which he reasoned most doubtingly, but upon which, according to the oft-repeated declarations of the Medico-Chirurgical Review, "*all our knowledge must ever repose,*" are wholly unlike those I have produced, described, and published, that is, Bell's are not the *appropriate motions* intended by nature, such as are performed during life. In Bell's Nervous System of the Human Body,—his great work, it is said, that "on irritating the anterior roots, an *evident* motion was produced on the muscles, not only *perceptible* to the eye, &c. The motion was not the slight tremulous motion arising from the natural irritability still remaining in them, but it was *convulsive* and *spasmodic.*"* Bell's animals were, so far as he indicates their condition, not half dead. He proceeds thus: "cut across the nerve which had the power of exciting the muscles, and stimulate the one which is undivided, the animal will give indications of *pain*; but although the nerve be injured so as to cause *universal agitation*, the muscle with which it is directly connected does not move." "To expose these nerves requires the operator to *cut deep*, to *break up the bones*, and to *divide the blood vessels*. All such experiments are much *better omitted*; they *never can lead to satisfactory conclusions.*"† True, but what then becomes of the discovery? Indeed, this eminent man lost faith in his own discovery, at least, in its experimental proof. When M. Müller published experiments confirmatory of Bell's theory, the latter repelled them, declaring that "he preferred to build on *Anatomy* and the *vital powers*, not on the *galvanic* conducting powers of the nerves."‡ Was there ever such a case before? The discoverer has misgivings, doubts,—repudiates his own experiments without which, his discovery can have no existence, except as a *conjecture*, without even the aids of analogy; the more he doubts, the more strongly others believe for him; the more *obscure* are his experiments to himself, the more concentrated is "the burst of light" to every one beside! When he had much faith, others had none; when he had little faith others had much. Who has the truest respect for the memory of the illustrious Bell, Dr. Dowler, who believes in his honesty, or his London friends, who do not?

My Reviewer speaks of "Bell's splendid discovery," as "having brought conviction to the professional mind of Europe," as being "a great truth henceforth to be ranked as one of the fundamental principles," while the closing paragraphs in Bell's Nervous System, are devoted to the discrediting of the very experiments without which, I repeat, this discovery is nothing but an opinion: "I feel a hesitation," says he, "when I reason on *any other* ground than on the *facts of anatomy*.—*Experiments* are more apt to be *misinterpreted*; and the very circumstance of a motor and sensitive nerve being generally combined together, affords a *pregnant source of error*. It is natural to suppose that the galvanic influence might be brought to bear on this subject; but I may be permitted to suggest to any one who pursues it in this way, that it

* Amer. Ed. Preface, 10. † ib. 128. ‡ Med. Chir. Rev. 1834.

will be necessary to *distinguish the effects produced by the nerve as a mere conductor*, and when performing *its living functions*. The nerves *dead or alive* may convey the *galvanic power like a wet cord*; but if the nerve be in possession of its living property, a great deal will depend on the *direction* in which the galvanic fluid is transmitted.*

“Does the nervous fluid (to use a hypothetical term) pass ever in the same direction, outwards from the brain in one nerve, and towards it in another, can it be propagated by the same tube or fibre backwards and forwards in two opposite directions, at the same instant of time? I apprehend that it cannot. What then is the difference of those two nerves? Is it in the direction in which they convey their impression, [or fluid] since it is proved that they are both connected with the sensorium, and both connected with the muscles? I am *inclined* to say that it is so.—It *may* then be, &c. I am *quite at a loss*, &c. I am *inclined* to say there is a circle in the nervous system; that one nerve conveys its influence towards the muscle, &c. At all events a mistake has prevailed †,” &c. How cautious! nay, skeptical! Long since I pointed out the error into which writers have fallen in attaching to Bell’s experiments a value, a meaning, an extent, and a certainty, disavowed by *himself*. His almost dying declarations against the conclusiveness of his own experiments, though left on record in his most authoritative work, are rejected lest the great Islanders should lose the glory of “the second great discovery!”—a new feature in literary annals! In the *Lancet* the experiments are praised,—the experimenter condemned!—It “deplores the weakness of this eminent man in *dispraising*, in the latter part of his life, physiological experiment, which had been the means of establishing the product of his own genius.” ‡

What then is this “second great discovery” which Sir Charles Bell is said to have made, and of which, albeit, *he* speaks so doubtingly?—The uninitiated would scarcely suppose that an actual discovery, such as some persist in calling this, could be still involved in the utmost obscurity;—that experiments, experimenters, and opinions, are still about equally divided;—that the anatomical, physiological, and pathological phenomena, involved, afford no positive knowledge, whether the brain and spinal cord perform actions separate, independent, opposite, conjoined or associated. Their *rôle* in the hypothetical Nervous Circle; the precise functions of the spinal nerves in receiving, carrying, and returning the hypothetical fluids, impressions, vibrations, particles, and “the mysterious messengers,” first to the anterior, then to posterior roots, or the contrary, no man knoweth. M. Magendie concludes from his experiments, “that sensation does *not* belong *exclusively*—*n’est pas exclusivement*—to the posterior roots, any more than motion to the anterior:” “I obtained contractions from each—*avec les deux sortes*. §—Hence, “Magendie allows both *sensation* and *motion* to *anterior*, as well as *posterior roots*. Müller’s experiments on frogs would, indeed, indicate a distinct appropriation, but the anomalous organization of these animals discovered by Volkmann, will probably appear, to all who are

* Nervous System, 180.

† *Ib.* 218–19, On the *Nervous Circle*, App.

‡ December, 1846.

§ Jour. Phys. Expér., Oct. 1822,—cited Doc. 97, 98.

not partizans as calculated to leave the great question *still subjudice*.*

In the *Physiological Anatomy and Physiology of Man*, the first volume of which I have lately seen, and which was first published in London in 1845, the following statements are found: "The irritation of a motor nerve in an animal recently dead, causes contraction of the muscles to which it is distributed. The simplest way of applying a stimulus for experimental purposes is by passing a galvanic current from a small battery."† "The function of the anterior roots of the spinal nerves was discovered by Bell, *but from the violence of the operation and the pain produced in performing it, it was impossible to determine what degree of sensibility remained in parts supplied from the divided roots.*"‡ These authors say, that when the anterior roots are divided at their emergence from the cord, "no motion can be excited by stimulation of the surface, nor by stimulation of the cord itself"—"the stimulus acts through the afferent nerve upon the centre, by which the motor nerve is excited."§ They witnessed Matteucci's electrical experiments on frogs while their work was passing through the press, and conclude with him, "that the muscular current is quite *independent of the nervous system.*"|| "Contractility is a property of the *living* muscular substance as such."¶ "We enter our protest against the doctrine which assigns the spinal cord as the source of muscular irritability. This doctrine, indeed, has but slender support in reason or experience. It is contrary to all analogy to assign to *one* tissue, the power of conferring vital properties on *another*. If bone, tendon, and cartilage have their distinctive properties, they possess them in virtue of *some peculiarity inherent* in their mode of nutrition, and do not derive them from *any other* texture. And surely, it is too much to suppose that a tissue, like *muscle*, so complex in its chemical constitution, and so exquisitely organized for the development of its proper force, should be *dependent on the nervous system, or a portion of it, for its contractile power*. Our own experience is quite *opposed* to the statement of *Dr. Hall*, that in cases of palsy dependent on cerebral lesion, the muscles of the affected limbs acquire an *increased irritability from the cord*, which he supposes to be the *source of irritability remaining intact*, while the influence of the exhauster of irritability (the brain is removed.) In all our experiments, which have been numerous, we have found the palsied muscles less excitable by the galvanic stimulus than those of the sound side."** "It has been supposed that the *tone* of the muscular system is maintained by the *spinal cord*. We can only remark, that the phenomena which characterize that state are just as obvious in muscles taken from animals, recently deprived of the spinal cord as in others; and that the analogous state, the *rigor mortis*, comes on as distinctly when the cord and brain have been removed, as if they were *untouched*."†† "The removal of the spinal cord produces flaccidity of the muscles, owing to the immediate cessation of the slight degree of active contraction necessary to *maintain a*

* *Doc. Nerv. Syst.* 111, Lond. 1839.

† 303-4. ‡ 306. § 312. || 378. ¶ 190. These doctrines are very sound—such as I had previously advocated, published, and *proved experimentally*.

** 341.

†† 340.

certain posture." "We use the term spinal cord in its ordinary sense—we reject the hypothesis of a true spinal cord, anatomically distinct from that which has to do with mental nervous action."* Whether these able writers are always consistent, the preceding, and especially the following quotations will show: in summing up they "conclude 1. That the spinal cord in UNION with the brain, is the instrument of sensation and voluntary motion to the trunk and extremities. 2. That the spinal cord may be the medium for the excitation of movements, independently of volition or sensation, either by direct irritation of its substance, or by the influence of a stimulus conveyed to it from some surface of the trunk or extremities by its nerves distributed upon that surface. This latter office of the cord, although recognized by WHYTT, PROCHASKA, BLANE, and FLOURENS had not attracted all the notice which its great importance merits, until the researches of Dr. Marshall Hall and Professor Müller drew attention to them."†

The Reviewer biased in favor of his "distinguished countryman,"‡ as well as English frogs and turtles, and remembering that the Review stood deeply committed to Bellism, naturally enough shows an eagerness to maintain his ground, and to annihilate oppositionists. But no one could have anticipated his attack on the human subject, nor his pertinacious preference for frogs, as subjects for the study of human physiology! But here he is not singular, for on the Continent, physiologists of the highest standing manipulate this interesting animal, with electricity and with scratchings, from year to year, and in some instances by the authority of the State, as in the case of Professor Matteucci, of the University of Pisa. Happy Matteucci! he lectures on frogs by appointment from the Tuscan government,—the treasury pays him. He experiments on frogs, and the Royal Society honors him with the great Copely Prize. To ply frogs with electrical batteries, so as to cause unnatural muscular motion, is the exclusive road to medical honor, as well as to medical knowledge, and opens the true gate of discovery!—Molière mentions a doctor whose pathological doctrines all centered in the lungs. His patient said he had "pains in the head." "Exactly," said the doctor, "poumons."—"Dimness of sight."—"Poumons."—"Weakness in all the limbs."—"Poumons."—"Colic."—"Poumons."—"An appetite."—"Poumons."—"A love of wine."—"Poumons."—"Sleepy."—"Poumons." So in physiology, *Grenouille!* frog!

The Reviewer sets out with "a decapitated turtle or frog,"—tells the old story about "irritating the posterior roots," "the muscular actions, which are totally prevented by the destruction of the cord," and concludes, "can any one, we ask, entertain a doubt that the consequences would also be the same in man, with a spinal centre constructed upon essentially similar principles?" It is necessary to dwell a moment on this assumed analogism, nay, essentialism, to speak like the Reviewer, who stakes his all upon the naked, spinal experiment, without the aid of sneezing.

* 340, 339.

† 312.

‡ The Medico-Chirurgical Review, (January, 1847,) in the name of Great Britain, thanks Harvey, Bell, and Hall "for the undisputed glory of the two mightiest discoveries in physiological science!"

Is it true that a frog is the *essential analogue* of man, in its anatomy, physiology, pathology, parturition, natural history, and so forth? Of the frog, Cuvier says, "it buries itself during the winter under ground, or in the mud below the surface of the water, where it continues to live without *food or respiration*."* Réaumur knew frogs to live in hot springs at 111°, and Spallanzani, at 138° Fahr.† Many facts have been reported, showing that they have lived for ages without food and air in rocks and trees, wherein they had been completely and narrowly enclosed, &c.! Mr. Paget's Report on the progress of Anatomy and Physiology in the British and Foreign Medical Review, for April, 1845, contains the following statement, which is here somewhat abridged:—"To prove the functional independence of the sympathetic nervous system, Volkmann and Bidder, (Müller's Archiv. 1844,) have published an extensive series of experiments on the effects of removing from frogs, the brain, or spinal cord, or both, leaving the medulla oblongata,—the muscles were rendered at once incapable of contracting upon either voluntary or reflex stimulus, the circulation continued unimpaired two weeks after crushing the cord, fourteen days after destruction of the brain, five days after destroying both at the same time; the pulsations were as frequent and vigorous as in healthy frogs, the processes of exudation, absorption, urinary secretion, defecation, digestion, continued as usual; on the whole, no organic function was materially disturbed by the destruction of the brain and spinal cord."

The following quotation is taken from documents on the modern discoveries in the nervous system:‡ "The circumstances in the structure of frogs pointed out by Volkmann, (an anomalous distribution of ganglia and ganglionic fibrils upon the precise parts which are the subjects of experiment,) must in all experiments on these animals, have been attended by demonstrations only of correspondingly *anomalous*, instead of *regular function*."—Once more: "Redi removed the brain from a land tortoise. It appeared for several months to *enjoy life, and exercise its functions nearly as before the loss of the brain*."§

Professor Matteucci, in his work on Living Beings, (1847,) maintains, from his celebrated experiments upon frogs, that contractility is the vital property of the muscle *alone*,|| and cannot be explained by electricity or

* An. King. 286, Lond. 1840.

† Ency. Brit. Ed. 1842, XIX, 153.

‡ Intro. 3.

§ Edin. Ency. X. Herpetology.

|| "Inattention to the structure of nerves has led to a *mistake, that they have a power of contraction*." (Bell's Anat. Phys. II, 53.) The very nerves which give all motion, have none whatever! Though I am no friend to the *exclusive* motor function of the nerves, I never could go so far as this, much as it is in my favor. Although the entire limits of this paper, would scarcely suffice to warn the student against the illusions of the microscope, as an *exclusive pathological instrument*, yet, the following statement by M. Mandl, (author of a treatise on the microscope,) before the Academy of Sciences, in a recent sitting, may be worth translating: (See L'Illust. Feb. 20, 1847.) M. Mandl, said that he had observed motions in the nervous system of leeches, magnified from 50 to 60 times. He separated a portion of the living leech, from the ganglionic chain, placing it in a drop of water, after having torn its black, cellular envelope, isolating the ganglion and the nerve, he noticed vital contractions as in the muscular fibres. M. Flourens remarked upon the occasion,

any other known cause. The same number of the Review, which declares in opposition to myself, that the doctrine of Bell and Hall "is a great truth henceforth to be ranked as fundamental," offers to the rising sun of Italy, superlative laudations: "Matteucci's work is alike valuable and interesting to the general reader and the professional man, to the natural historian and natural philosopher, to the physiologist and the practical physician, etc." At the same time it is said, "our readers will not fail to perceive that the conclusions drawn by Matteucci from *his experiments* are opposed to the views of Dr. Marshall Hall. The Italian professor regards the irritability of the muscular fibre as *inherent*, whereas Dr. Hall considers it as *derived from what he calls the true spinal system.*" Now, if "the professional mind of Europe" can adopt these contradictory views of the Reviewer, or prove that man can live in good health for months without the brain and spinal marrow, "that little or nothing can be learnt in physiology without these cruel reptilian experiments, (heretofore denounced by the Medico-Chirurgical Review,*) and that premises laid among these, can legitimately be appealed to, in order to bring out conclusions in the medical sciences, so as to harmonize human physiology, pathology, therapeutics, and obstetrics, then, it must be admitted, that "the European mind" has made great advances, indeed. But it may be doubted, whether any act of the "professional mind," can make frogs essentially like men, not to say anything of endowing them with a physiological superiority! Sidney Smith maintains that frost cannot be put off by act of Parliament, nor can spring be accelerated by any majority of both houses. In analogy, of an obscure kind, the same difficulty is not experienced. Hamlet saw in the entire world, the analogue of an extensive prison, having "many confines, wards, and dungeons; Denmark being one of the worst."—Polonius found in a cloud, the analogism of many things at once; "it was like a camel, like a weasel, and very like a whale."

Next to the Duke of Otranto, (Fouché) the Reviewer is becoming the most profoundly cunning and calculatingly equivocal of mortal men. In his review of Dr. Hall's works, (January, 1847,) biting irony, bitter denunciation, and extravagant laudation, are showered upon that author in equal proportions, while his *morale* and the fallacious import of his experiments, "his manglings and his mutilations" are painted the most revolting colors; whereupon, the Reviewer (who could have anticipated what follows?) takes a fit of patriotic glory, in behalf of the happy land which is "honored as the birth-place of Hall's mighty discovery:" "Ten years ago, (says the Reviewer,) we spoke of his labors in these

that he had seen in his experiments upon the functions of the nervous system, a real and active movement on bringing together the two ends of a divided nerve. M. Serres, he continued, had long ago, published experiments upon the contractility of the ciliary nerves.

Professor Liebig, adopts the bold assumption, that the nerve is the exclusive source of muscular motion, and this too, in the most literal, nay, mechanical sense, so that the *rôle* of the muscle, is that of a mere subordinate, passive, powerless instrument. (See An. Chem. 66.)

* When this, the Fiftieth volume of the Review, recommending as the very basis of physiology, cruel and fallacious experiments, shall be placed side by side with its fellows, will not the great *ci-devant* spirit of that work frown upon the new comer?

words:—‘ He has evolved a *simple fact* (that of involuntary contractions following the irritation of the corresponding sensory nerves as long as the part retains its connection with the spinal cord) INTO AN EXTENSIVE AND INGENIOUS THEORY.’” The Reviewer divides the world into two classes, (“ocean into tempest wrought to waft a feather or to drown a fly!”) both being against Hall; “one party attempts to rob him of his fame, the other to quench the torch of discovery! No such reproaches can be made against us!” Fortunate critic! May you live a thousand years, and have for your epitaph—“No such reproaches, &c.” You utterly repudiate Hall’s experiments as worse than useless. Yet, they have “evolved the simple fact,” “the great discovery,” “the ingenious and extensive theory!” Reader! I pray you, to remember that in the year 1847, this renowned Review based the second great discovery, wholly on Dr. Hall’s irritation of the spinal sensory root, and the consequent muscular movement. This is really the true state of the question, the real issue, and woe to him who shall change it! The malediction as read by Dr. Slop, is not too severe for such an one. The American Journal of the Medical Sciences, in an elaborate review of Dr. Hall’s Nervous System, (February, 1839,) says: “The system is simple, and rests upon experiments which may easily be repeated.” If the issue be not changed, Bellism and Hallism will soon be expunged from, instead of forming the material of the medical cyclopædia.

An English traveller has admitted the superiority of American thunder. I regret that I cannot in return, concede as much for English Logic, if the Reviewer’s be taken as an average sample? First, the Reviewer lays down the broad deduction, immovable as the rock of Gibraltar, ponderous as *inertia itself*, “Dr. Dowler brings forward as a novelty what is familiarly known to all careful observers on this side of the Atlantic.” But after a few broadsides in this behalf, (the smoke being dense, and fearing that I might not only survive, but prove a *bona fide* discoverer,) the Reviewer terminates the engagement by a *coup de main*. Being influenced by a scientific *amor patriæ*, and knowing a very learned and worthy countryman of his, straightway he hoists the flag of discovery over his domicile: for if after a declaration, that all Europe knew all about this matter, it should turn out that nothing was known, then it would be very well to fall back on the question of priority.

“Mr. Bowman was the *first writer* who distinctly showed by microscopic observation, that the individual muscular fibres *contracted independently* of the presence of the nerves; and we have here the *clue to the more extensive but essentially the same phenomena related by Dr. Dowler.*” If Mr. Bowman ever made any observations similar to mine, I am wholly unacquainted with them. I am convinced, from the concurrent opinions and statements of writers,* that none such exist. I

* In the new edition of the Encyclopædia Britannica, Dr. Roget, in his elaborate treatise on physiology, makes the following important statement, showing the actual doctrines, as late as 1842,—a period later than that of my experiments: “Mr. Mayo ascertained that after any nerve which supplies a voluntary muscle is cut through, either in a living animal, or immediately after death, mechanical irritation of the part of the nerve disconnected with the brain, as for instance the pinching it with the forceps, causes a single sudden action of the muscle or muscles it supplies. On the other hand, a like effect cannot be produced by irritating mechanically the nerves distributed to those muscles over which the will has indisputably no influence.” (XVII. 675.)

ask for documents and dates. It is believed that no work of his, having any bearing on this subject, had been received in this country, or even published in London, until years after my experiments upon post-mortem contractility began, and a number of cases had been published in the *Western Journal of Medicine*. Mr. Bowman's *Physiological Anatomy*, sound as it is in general, is quite *too recent*. It contains nothing so far as published, at least so far as I have seen, touching my method or results. I have quoted, in another part of this paper, all that I have seen having a bearing on certain views of mine. The insinuations of the Reviewer about "microscopic observation," and his "fears that physiology has not penetrated very deeply into the American professional mind" are gratuitous, and, I herewith give the opinions of the American mind" as published in various journals, on the originality and nature of these researches, in opposition to those of the Reviewer, without any fears that the European and American minds, will differ materially on this or any other medical subject. As to the *CLUE*, that is, "the thread that is used to guide a person in a labyrinth—any thing that guides in an intricate case,"—why should I take the *clue* in this case, from Mr. Bowman, seeing every body, on at least one "side of the Atlantic," had long known the whole matter? The Reviewer says, "Mr. Bowman was the *first*, &c.,"—"Dr. Dowler took the *clue* from him," to discover "what is familiarly known to all careful observers!" As a medical bull, this is not bad; as logic, it is contradictory; as a criticism, it is the morphological type, which each sentence of the entire article tends to develop, until a monstrosity is at length brought forth, in which St. Hilaire himself, were he alive, could scarcely detect any unity of organization.

I will presently proceed to show what is the opinion of "the American professional mind," concerning these researches, upon which the Reviewer "places a very low value," while at the same time, he denounces in effect, all who think differently, as ignorant of physiology. The writers of the following extracts are personally unknown to me, except as being among the most eminent authors, and professors, in America, not one of whom, it is confidently believed, could be benefited by the praise, or injured by the censure of the Reviewer. Were I so immeasurably beyond the reach of the editor, I would regard his criticisms as being as harmless, as they are uncandid and sophistical.

The Reviewer, assuming an unwarrantable jurisdiction over the new Continent, as if unwilling to permit the republication of any pamphlet but his own Quarterly, fulminates the charge of culpable ignorance, (at least by an indirection,) against the American profession, if it shall "attach any importance to my researches," a provisional amnesty, but not all available, inasmuch, as the dreaded contingency has really happened. Sentence must be pronounced: "If," says the Reviewer, "the republication of these views, [Dr. D's.] be the result of any peculiar importance attached to them on the other side of the Atlantic, we fear that modern physiology has not penetrated very deeply into the American professional mind:" but, as if the very demon of contradiction had possessed his *critique*, he, in another place, (forgetful one!) acknowledges these views to be both "*interesting and instructive, if they had been published to illustrate a class of obscure phenomena,*" and

not in opposition to his favorite theory, "upon which *all* our knowledge must ever repose." His sneer at "the American professional mind," is undeserved, seeing that by his *own estimate*, my researches are "*not devoid of interest, are not uninteresting*,"—a praise, which that journal expressly denies to, perhaps, nine-tenths of the publications in Great Britain, as its pages will testify. But *Samuel Johnson* set the example: he abused Goldsmith freely, but would allow no other person that luxury: so with the Reviewer. But to spit a criticism, or rather an animadversion over the Atlantic, for "attaching importance" to what the Reviewer himself calls an *interesting*, and an instructive republication, is a thing without example.

Of all the medical journals in the country, that of Boston has been the first and most decided in speaking upon this, and upon several subjects, in which I have been an humble actor, but in terms so flattering to the experimenter, that I must forego the advantage of its disinterested and weighty testimony. I have, in making the quotations which follow, avoided complimentary expressions as much as is possible consistent with my aim, which is, to show the *importance* and *originality* of these researches, which the Review and others, seek to undervalue by an array of great, opposing names, without any direct proof whatever, excepting stale experiments, wholly unlike mine, and foreign to the subject under consideration, and therefore, inadmissible in the study of human physiology, much less for the establishment of an *entire new system of philosophy*—another *NOVUM ORGANON*.

With the exception of a single journal, which dissents to one, perhaps more, of my leading opinions, the numerous medical journals "on this side of the Atlantic," which have noticed the "researches," have conceded the question of originality, or "have attached importance" to the same, though not having copies of all these, the following may suffice.*

"The experiments made by Dr. Dowler on Post-mortem Contractility, are highly interesting and important to the physiologist. * * * These experiments are new, and reflect great credit on Dr. Dowler as an accurate observer." (WESTERN LANCET. Lexington, Kentucky.)

"Dr. Dowler is favorably known to the medical world as the author of several original views in physiology. His interesting trains of researches on Febrile Caloricity, and on the Post-mortem Contractility of the Muscles, have not failed to elicit the attention of the profession."—(SOUTHERN MEDICAL AND SURGICAL JOURNAL. Augusta, Georgia.)

"We are free to confess the fact that contractility, in the cadaver at least, is inherent in the muscle, independently of all its nervous connections, is abundantly proven, admitting the experiments to be valid, which we have no reason to doubt. The muscular contractions must have been produced exclusively by the act of percussing upon the muscles, not involving the nerves leading to them; for contractions were in all instances limited to the muscle or muscles struck, and hence, by percussing appropriate muscles, each or all the muscles of the forearm, for example, could be produced at pleasure. * * * The observations of Dr. Dowler demonstrate that muscular contractility exists in the tissue, per se. * * It is well known that the subjects of the experiments

* I have sometimes *Italicized* the text.

upon which the doctrines of the reflex school *are based*, were taken chiefly from the Batracian class of animals. * * * The coarse, cruel, and *fallacious experiments* practiced, are *justly* repudiated. * * * We come now to the method of Dr. Dowler, which certainly has the merit of simplicity; but is not less worthy of attention and confidence on that account. * * * In closing this review we should do injustice to our appreciation of the labors of Dr. D., if we omitted to express the great gratification with which we have read his valuable paper. His observations on muscular contractility, and the temperature of the body after death, are of a striking character, and cannot fail to excite the lively interest of physiologists. We are sorry to learn that not only have attempts been made to deprive him of his claims to originality, but that the exactitude of his observations has been flippantly discredited. The experiments can easily be verified, which does not appear to have been done before calling his facts in question. We trust he will be encouraged to continue and extend his experiments, relying as he certainly may do with confidence, that justice will be done both to himself, and to the facts which he may develop." (BUFFALO MEDICAL JOURNAL, New York.)

"Our pages have in a former number contained some account of Dr. Dowler's experiments in reference to *post-mortem caloridity*; since then, the profession has been made acquainted through other publications with his observations on *post-mortem contractility*, which are little if at all less curious and suggestive than those on the former subject."

(MEDICAL EXAMINER, Phila.)

"The essay" [on contractility] "is *replete* with matter of *very deep interest*, may be the means of introducing more *correct views* of the functions of the nervous system, and a *modification* of at least some of the *pathological theories* of the day. The *results* of Dr. Dowler's experiments are we must confess, as *unexpected* as they are *important*. That the muscles were capable of being excited to contract for sometime after death was known to physiologists, but it was admitted that the period this capacity to contract existed was very short, and that it could be excited into action only by some *powerful agent*, as *electricity* or *galvanism*, but that *genuine muscular contractions could be produced for many hours after death by a simple blow of the hand*, was a fact NO ONE SUSPECTED until the appearance of Dr. D's. ORIGINAL paper." (THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES. Phila.)

I copy a small portion of my scientific correspondence, omitting names, places, and dates, as I have no means of knowing, at this moment, whether the writers would, or would not allow me to publish their names. I will say, however, that as professors and authors, they stand high "on this side of the Atlantic." They are "well informed observers," though they do not charge me, as does the Reviewer "with bringing forward as a *novelty*, what was *well known* to all careful observers."

"Your article on the reflex, &c., makes a great deal of talk here.—Prof. — is warm in its praise; they *all think* you have gone far to upset Marshall Hall."

"Nor can your *facts* run any risk from his * * * *speculations*.—Go on fearlessly. Truth is mighty and will prevail."

"He [Dr. Hall] will give you a sharp review. It will be a battle worth looking at "when Greek meets Greek," &c. I can't say how bets would go at present, though I have heard several good judges will stake two to one, &c."

"I must say without any intention to flatter you at all, that you have been *perfectly successful* in the accomplishment of your object. But is it not very unkind in you, to knock this eminently beautiful reflex theory on the head? It was so pretty, so very consistent with many phenomena! such a beautiful assumption! I do not know what some of our *confrères* will do, now thrown so completely at sea again. Those experiments must have fallen like a bomb-shell among the *nervous physiologists*. Your *discoveries are exceedingly important*. Time will apply them to practical purposes. Anticipate that time. Go to the utilitarian* work of deduction. To be sure you have blown to the winds the fine cob-web theories of your opponents, together with all their deductions. That is something;—for next to the discovery of a new truth, is the destruction of an error. [I] should like to be near Hall, &c., when he reads your paper."

Ask, O! student of medicine! ask your unprejudiced judgment, were there ever errors so general, and yet so stupendous, as those now called modern discoveries in the nervous, especially the spinal system. Are they not wholly based on certain experiments, which have no known connection with the doctrines sought to be deduced from them? Have these phenomena any fit scientific application, except to the individual animals or class experimented on? Have these phenomena any probable value even in this identical class excepting the special conditions induced by vivisections, and so forth? Can denaturalizing processes, illustrate, nay constitute complete discoveries in, and for conditions essentially different? Were these phenomena derived directly from man, or from an animal precisely similar, would they be admissible proof, by which, to establish the one hundredth part, of what is now supposed to be established by them? Are not these phenomena for general pur-

* Should my correspondent ever see this paper, let him read what Professor Whewell has said upon this subject: "The nature of knowledge must be studied in itself and for its *own sake*, before we attempt to learn what external rewards it will bring us. (*Philos. Induc. Sci.* i, 14.) "*No scientific discovery can, with any justice, be considered due to accident*. In whatever manner facts may be presented to the notice of a discoverer, they can never become the materials of exact knowledge, except they find his mind already provided with precise and suitable conceptions by which they may be analyzed and connected." (*Ib.* ii, 189.)

Schiller says of Wisdom,—

To some she is a goddess great;
To some the milk-cow of the field—
Their worship is to calculate
The *butter* she will yield.

The London correspondent of the New Orleans Bulletin, in his letter (of the 3rd of July, 1847.) giving an account of the Scientific Association of Great Britain, which had just closed its labors, and which includes many of the learned throughout Europe, adds, "the only objection to the Association is, the *applicability of their discoveries is not in any way made the subject of attention*.—*To discover, not to apply, is their motto*."

poses obscure, blind, meaningless, and therefore, valueless? or at least not yet matured into exact science? These experiments are praiseworthy, and constitute a portion of knowledge, highly interesting, in comparative physiology, but very limited in their import; but they neither prove the nature nor *modus* of sneezing, nor do they constitute scientific midwifery; they do not prove that the passions and paralysis, hæmorrhage and convulsions, are exclusively due to "the true spinal marrow." These matters are thus, not without reason, alluded to frequently; and, as I have satisfied myself, if not others, that muscular contraction is not dependent on the spinal marrow or nerves, and, that therefore the fundamental principle of the new system is absolutely erroneous, I deem it no crime to publish what I believe, though the times be troublous, though neurological terrorism now reigns, and opposition, like spitting against the wind, is spitting in one's own face, France, so celebrated for medical science, heretofore, generally opposed to the most important improvements and doctrines of English medicine and surgery, (witness Hunter's doctrine, of healing wounds by the first intention,) has bowed to Bellism, and of course, Reflexism will follow. But history is, in such cases very instructive.

Broussaisism lived and died within a few short years. Before his doctrine prevailed, France exported leeches to a considerable extent; in 1833, the imports exceeded the exports, about forty-one millions, being an increased consumption to that amount. Three or four years ago blood-letting to fainting often repeated in the same case, was essential! Now in some of the largest fever institutions in the world, not a vein is opened during the entire year! Humoralism replaces solidism; the nerves, gastritis; stimulants, leeches; quinine, calomel! What is it, that authority cannot be brought to support? If great names can be quoted in favor of Reflexism, the same is true of mesmerism, hydropathy, and homœopathy; but facts, nature, science, do not change, or if they should even change, they cannot be brought to sustain propositions and theories which contradict each other.

The following just views, by a correspondent of the *Lancet*,* deserve much attention: "How strange and inconsistent in modern pathology is this exclusive reference to the nerve, in all questions relating to the nature and treatment of muscular disorders! In the operations of disease, every organ, excepting the muscle, is supposed to originate its own symptoms, and to maintain its own process of damage or cure.—Heart, liver, lungs, kidney, are thus made responsible, by name and in their complete structure, for the disorders affecting their several functions. The muscle alone, of all organs, in truth, the most independent is never suffered in the lists of nosology, under its proper designation, but finds a place, by right of spasm and palsy, in the loose catalogue of the neuroses, as a mere part and offsett of the so-called nervous system. By most practitioners, when a consultation on disorders of the contractile function, muscular and nervous are used as convertible terms, for the expression of their views in the treatment of the case. In the physic of 1846, there is no greater, no more mischievous error, than this substitution, in the complete organ, of a part for the whole, this degradation,

* October, 1846.

in the nosology of spasm and palsy, of the blood and the fibre, by distinction, undue and exclusive of the nerve. No palsy, it is well known, is more sudden and complete than that which follows on interruption of the blood-current in the affected muscular structure, though its nervous material be everywhere sound and complete. Be assured that it is not a mere speculative question, how far in palsy of the muscles, the prevailing nervous theory should be suffered without rebuke." The writer argues that patients are put to great and useless torture by this limitation of the treatment to the nerve, "by cupping, blistering, moxa-burnings, caustic issues; from the drain and irritation consequent on these severe local applications, there is serious, it may be fatal, irritation of the original symptoms."

Without admitting that the recent neurological discoveries, so called, are well established fundamental truths, I propose to give a critical sketch of the historical progress of the same, which, however, imperfect, must be regarded as a desideratum to the medical student, who will with every aid, find himself perplexed in this branch of science, even at the present era, after all the illusory announcements put forth, as if the whole temple of medicine were completely irradiated with some sudden gush of light. The discoveries attributed to Bell and Hall, are viewed by many as due to those who preceded them, and even to ages very remote.

In a review* of Mr. Adam's Translation of the works of Paulus Ægineta, an author who wrote according to Springel, A. D. 634, it is asserted by the Translator, that all the merit of the discovery of the anterior and posterior roots of the spinal marrow, belongs not to Sir Charles Bell, but to the ancients, Erasistratus,† Aretæus,‡ and Galen; especially the latter, who maintains that the "nerves have three uses, namely, to communicate to the organs of sense their respective sentient faculties; to excite motion; and to enable their organs of the body in general to discern what might be injurious to them," (lib. v. c. 9.); a theory which Aretæus had previously published, namely, that there are "*sensatory and motor nerves*" altogether *distinct*.§

Passing by all the neurological observations of more than thirty centuries, which afford little more than prelusive suggestions, unaccompanied by demonstrations, we come down to the moderns, particularly to Robert Whytt, of Scotland, who died in 1766, after having published several ingenious works on the physiology of nervous system. In his book on the Nerves,|| he dwells chiefly on "that sympathy which obtains between the various parts of the body," and which he calls "a remarkable consent." But his essay on the Vital and Involuntary Motions of Animals, published in 1751, falls more directly within the range of this inquiry. Like that most acute, but often visionary metaphysician, Bishop Berkeley,¶ he ascribed muscular motion to the soul. Whytt goes so far as "to conclude that the motions of the *separated* parts of animals are owing to the *soul* or sentient principle still continuing to

* Med. Quart. Rev. April, 1834, cited, Doc. 7, et seq.

† B. C. 304, Sprengel. ‡ A. D. 81, ib. § Documents, &c., 8, 9.

|| Third Edit. Edin. 1768. ¶ Berkeley's Works, ii, 90. Lond. 1843.

act in them,"* "though not attended with reflex consciousness, a power which the soul only exercises in the brain,"† "The various sympathetic motions of animals produced by irritation, whether in a sound or morbid state, are owing not to any union or connection of their nerves, but to particular sensations excited in certain organs, and thence communicated to the brain or *spinal marrow*."‡ "Dr. Hales informed me (he adds,) that having many years since tied a ligature about the neck of a frog to prevent any effusion of blood, he cut off the head, and thirty hours after, the frog moved its body when stimulated: but that on thrusting a needle down the *spinal marrow*, the animal was strongly *convulsed*, and immediately after become *motionless*."§ These quotations are not reproduced for their truthful expositions of physiology, nor for their similarity to the reflex doctrine, but for their language and suggestive character; as "*reflex sensation, sympathy transmitted to the spinal marrow, a loss of motion on disintegrating the latter:*" for example, the statement that sympathy is transmitted *to* or *from* the spinal marrow without nervous connections, very naturally suggests the converse question, whether the nerves may not be the identical agents of transmission.

The same course of reasoning will apply to many doctrines affirmed by Haller: "The *same nerves*," he remarks, "most evidently are subservient both to *sense* and *motion*; so that we are not allowed to adopt *two distinct systems of nerves*, one *motory*, the other *sensative*." (*Phys. cccclxxxiv.*) Here the doctrine of Bell is mentioned, not assented to. If writers four thousand years ago had denied the possibility of setting up the printer's types, and the present useful applications of steam-power—had they asserted that lightning rods, electric telegraphs, and rail-roads would prove useless—vaccination, inefficacious—mercury, a cure for salivation—the bark and its salts or quinine, fatal in agues—or had they argued, that the blood was circulated *towards* the heart by the *arteries* and *from it* by the *veins*, and that etherization increased the pain of a surgical operations, it is almost certain that these false views, would have awakened inquiry, or rather would have revealed the truth, in almost every instance, and as a consequence: This mode of reasoning is not, however, very satisfactory, though worth something. Thus reasoned Polonius:—

"By *indirections* find *directions* out."

The reflex function or action of the nerves is the favorite doctrine of Professor Prochaska|| in his Latin works, from 1784, to the early part of the present century..

I give a little abridged, and corrected the translation of the work cited,¶ which fairly expresses the original, so far as I am capable of

* Documents, &c., 113. † Ib. 116. ‡ Ib. 121. § Ib. 121.

|| *Commentatio de Functionibus Systematis Nervosi, Opera Minora, etc.*—The verb *reflecto* and its cognates, together with terms characterizing the laws of light, as *angulus*, *incido*, *incidentis*, as well as *motor*, and the like were favorite words with this author, in his neurological speculations, nearly half a century before their adoption by Dr. Hall.

¶ Documents and dates of Modern Discoveries in the Nervous System.—London, 1839.

judging on comparison of both; Prochaska, says: "External impressions, which are made upon the sensorial nerves, are propagated rapidly through their whole length to their *origin*, whence they are *reflected*, according to a *certain law*, passing into certain corresponding nerves, through which, being again rapidly propagated *to the muscles*, they excite certain determinate motions. This place in which as in a *centre*, the nerves appropriated to *sense* as well as *motion*, *meet* and *communicate*, and in which the impressions of the sensorial nerves are *reflected* upon the *motor nerves*, is called the *sensorium commune*—a term already received by physiologists," [including the spinal marrow.] The original differs from the modern style only in its greater clearness; in quo impressiones nervorum sensoriorum reflectuntur in nervos motorios, etc.

Prochaska regards the *sensorium commune* as the great reflector; but unlike more recent writers, he includes under that term, the entire spinal cord—*totam medullam spinalem*, and although he does not *always limit*, he clearly recognizes the *separate, distinct, and independent reflex action*, now referred to "the *true spinal marrow*," and rendered as obscure as style can make it. Here, there is no room to doubt, because he first lays down the doctrine, and then gives examples: "That the *sensorium commune* extends to the spinal marrow, we learn from the *motions remaining* in decapitated animals, which could *not* take place without the consent and co-operation of the *nerves arising from the spinal marrow*; for if a decapitated frog be pricked, not only does it retract the punctured part, but it crawls and leaps, which could not be without the consent of the sensorial and motor nerves, of which the *common seat* must be in the *spinal marrow*—*cujus consensus sedes in medulla spinali—the part of the sensorium commune remaining.*" "This *reflection* takes place whether the mind be *conscious of it or not.*" Again and again, he distinguishes the *reflex function of the spinal marrow* from that of the *brain*, physiologically, and pathologically. "To these we must add all those motions which for sometime remain in the body of a decapitated man,* or other animal, and are excited by *pinching* the body, but especially the *spinal marrow*, and are governed by the residual part of the *sensorium commune*, which *is in the spinal marrow*"—*per residuam sensorii communis partem, quæ in medulla spinali est, reguntur.* "The *reflection* does not obey mere physical laws, wherein the *angle of reflection* is equal to the *angle of incidence*,† but *peculiar laws*. Many examples prove *this general law of the reflections*. Irritation of the internal membrane of the nostrils excites sneezing:—Vomiting, tremor, chorea, paroxysms of intermittent fever, &c."

"A general law, according to which the *sensorium commune*," [this term, be it remembered, includes the spinal marrow,] "*reflects sensorial into motor impressions*, is our preservation:‡ so that certain *motory*

* Galvanic muscular contraction, was forbidden by the King of Prussia in 1805, to be practised on decapitated criminals, because it increased the pain beyond the prescription of the law; as such persons were supposed to retain sense and consciousness! (*Med. Rep.* ix.) An electrical battery, sufficiently strong, would instantaneously kill, and probably, without any pain!

† Ubi angulus reflexionis æqualis est angulo incidentiæ.

‡ Generalis tamen lex, qua commune sensorium impressiones sensorias in motorias reflectit. est nostri conservatio.

impressions follow *external impressions* hurtful to the body, producing motions tending to ward off and remove the source of injury; and, on external or sensorial impressions beneficial to us, producing motions calculated to perpetuate that benefit. The principal function of the sensorium consists in the reflexion of sensorial into motor impressions—*præcipua functio sensorii communis consistat in reflexione impressionum sensoriarum in motorias*. No muscular motion can be excited, unless a stimulus applied to the sensorial nerves passes by a certain reflection to the motor nerves, and excites muscular contraction; it is certain that the reflection of impressions—*reflexionem impressionum*—for inducing these motions, takes place without consciousness—*sine animæ conscientia*.”

Dr. Hall who quotes Prochaska largely,* and must, therefore, know his doctrines, maintains, nevertheless, “that there is nothing in that author possessing *the most remote similarity to his own*,” whereas, it is evident, that Prochaska has expressed the *reflex doctrine as clear as is possible*, and free from the ambiguities and unwarrantable extensions, which Dr. Hall has given to it,—at best, a *mere hypothesis*. Let all who doubt this, examine with care, Dr. Forbes’ paper on this subject,† which I have just seen, and from which I do not quote, except the following passages as illustrative of Dr. Hall’s “efforts to sustain the *status* of the profession” in Europe, upon which the reader will find some further remarks in another part of this paper; a crisis has been reached—the nervous system is excited, and a little raving, with sub-sultus, and an occasional convulsion, are to be expected. Hence, the incoherent words of Dr. Hall, as “cowardice! calumny! falsehoods! courts medical!” etc. Dr. Forbes translates whole pages from Prochaska, from which he shows conclusively, that Dr. Hall’s pretensions to *originality* are unfounded,‡ adding, that the latter, “has taken every opportunity to depreciate the merits of Whytt and Prochaska, as if he were impelled by the conviction that his struggles for fame would be valueless, unless he scornfully trampled their claims under foot.

“Dr. Hall’s eternal trumpeting of his own great deeds, especially in regard to the reflex function, in every work he has published in almost every scrap he has printed,” &c.—“He has over and over again, and loudly proclaimed his own unequalled merits in this department, and scoffed at the pretensions of other excellent men, his predecessors or cotemporaries. He has either studiously passed over in silence or openly ridiculed and maligned Prochaska’s doctrine, and poured on the heads of those who did no more than assert their resemblance to his own, all the venom which his bitter nature could engender. And up to the very hour at which we write, he continues to boast as loudly as ever, of his originality, &c. We can add no comment in words that can in any way emulate, in damning potency, the eloquence of this simple statement.—It is grievous to be forced to write it down; it is melancholy to contemplate its full import.”

* Nervous System, 27, 45. Phila. 1836.

† British Foreign and Medical Review, for January, 1847.

‡ “All the *fundamental* and *acknowledged* views which are claimed by Dr. Hall, as exclusively his own, are to be found in Prochaska’s writings most succinctly and most clearly set forth.” *Ib.*

I feel justified in making these quotations to show the manner in which Dr. Hall treats those who do not, any more than myself, receive him in his mission as a discoverer, as well as to show that, if I do not always speak of Dr. Hall, (a man of ability, I admit,) with the respect which might seem requisite in matters purely scientific, there are the strongest reasons for my justification.* But leaving this subject, I proceed to conclude the historical sketch of modern neurological discovery, omitting for want of space, many illustrious names.

Mr. Alexander Walker preceded Bell, Magendie, Müller, Hall, and indeed, all others in discovering the leading features of what is now called Bell's discovery; for although the Bellites differ with him in regard to his ascription of the *sensiferous* property to the *anterior*, and the *motiferous* to the *posterior* roots, these are rather details than an absolutely new conception. His first publications were dated in 1808; those of the following year, speak thus: "wherever a part having both *sensation* and *motion*, is supplied from one nervous trunk, that trunk envelopes *both a nerve of sensation* and *one of volition*. The only apparent difference is that their motions takes place in different directions—the latter resemble the arteries, the former the veins." The "nervous circle" is dwelt on. The action or function of the nerves "passes to the spinal marrow, by the anterior fasciculi of the spinal nerves, which are, therefore, nerves of sensation, and the connections of which with the spinal marrow or brain must be termed their spinal or cerebral *terminations*,"† [even better than *Reflectors*.]

"In a comparatively recent work, (by Mr. Walker,) to which is prefixed some account of the author's earliest discoveries, of which the more recent doctrine of Bell, Magendie, etc., is shown to be at once a plagiarism, an inversion, and a blunder, associated with useless experiments, they have neither understood nor explained."‡

More than twenty years after Mr. Walker had published this view, setting forth in the clearest manner the *afferent* and *efferent* function of the nerves, after stating that this double function is performed by *separate nerves*, "a nerve of *sensation* and one of *volition*," we find Mr. Bell making exactly the same statement: "The nerves are sometimes separate; sometimes bound together; but they do not, in any case, interfere with or partake of each other's influence—one filament for sensation, another for muscular motion."§ In the same work, he quotes from his lectures to the College of Surgeons, a summary view of his system, of each portion of the nervous circle, of innervation, of experiments, and of muscular contraction; of each he speaks with becoming doubt, until at the end of the enumeration, getting out of the deep waters of uncertainty, he exclaims,—“At all events, you observe that *a mistake has hitherto universally prevailed* in supposing that *one nerve could*

* The Medico-Chirurgical Review, (January, 1847,) admitting as it does, Dr. Hall's claims as a discoverer, declares nevertheless, that "he is one of those characters that *will not correct his errors*; that *pertinacity* is the *very woof* of his character; that he deems it a point of *honor* never to change or concede aught, except to *himself*; that he is *jealous to paltriness*; that he continually repeats, *usque ad nauseam*, the same facts, dogmas, that he has not only erred, but has suffered much from this *arrogancy* of character, &c."

† Doc. 15, et seq.

‡ Doc. 17.

§ Nerv. Syst. 20.

perform *two* functions of opposite tendencies,"* and all this, the only thing he felt certain about, Alexander Walker had published long before.†

M. Müller undertook to experiment upon rabbits, with the view of ascertaining the functions of the spinal roots. "But he found that the previous operation of opening the vertebral canal was so difficult, and attended with such excessive pain to the animals, as frequently to induce involuntary twitches of all the muscles even when the nerves were not directly irritated, so that he was precluded from deducing any satisfactory conclusions."‡ He, therefore, fell back upon frogs, and upon galvanism! by which, through the anterior roots, he caused "*convulsive movements.*"

The Medico-Chirurgical Review calls this substitution of frogs for rabbits, "a happy thought!" and the reasons are these: "the vertebral canal of the frog may be opened with very little trouble, and with comparatively trifling pain; the animal is so tenacious of life, that it remains quite lively after the operation."§ If all this be true, it is one of the worst analogues that could be chosen for human, or even rabbit physiology. Who knows that frogs suffer but little from the dissection of the spinal cord? Is not this very tenacity of life, so unlike man, a good reason, not for their selection but their rejection?

I proceed next to the discovery claimed by Dr. Hall.—What that doctrine really is, seems to be at least, sometimes misunderstood. In a critique on my essay on muscular contractility, my quotations and references, were regarded as *too general*. It is remarkable, however, that the parties most interested have not complained. The short sketch now called for, will obviate all difficulties in this respect, and at the same time be acceptable, as I hope it will, to the student, showing what is the reflex system of Dr. Hall, and all Philo-Hallians, *not* the reflex systems of others. There is one fundamental error in the logic of this school, which must be corrected, otherwise nothing can be determined, namely, the introduction of collateral, irrelevant matter, with assumed analogies, quite overlooking the positive, direct, experimental proof, based upon the spinal cord, its roots, and the terminations of its nerves, which constitute the discovery, and *not* sterility, hæmorrhage, tic; the passions, parturition, &c.,—concerning these, no direct experiment has been offered.

By confounding the reflex doctrines, and by assuming for the living body, sundry reflex actions beyond the pale of my inquiries on contractility, I have been misapprehended by several critics. To prevent latitudinarian criticism, "stale, flat, and unprofitable" analogisms, I wish it to be distinctly understood, that, by nervous circle, the functions of the spinal roots, the reflex action, &c., I mean the doctrine of Bell and Hall, *founded on certain experiments*, as explained by themselves and

* Nerv. Syst. 218, 219.

† It would be tedious, and indeed, ungrateful, to enter upon the charges against Mr. Bell, in relation to certain dates prefixed to his papers, some of which it seems, were antedated, either by himself, or by others. (See Documents, 37.) Even his paper, "A New Anatomy of the Brain," which was printed, but never published, was later by several years, than Mr. Walker's publications.

‡ Med. Reg. cited from Med. Chir. Rev. 1834.

§ Idem.

their most ardent friends. If the *issue* is to be changed again and again, if new elements are to be introduced into this doctrine, then the war of logic will be eternal.

I proceed, therefore, to make the *amende honorable*, as my former quotations have not been sufficiently definite, I begin with Dr. Hall, in an order somewhat chronological, quoting in part from his first papers, as recently republished in London,* as well as from his later works.—“All movement ceased on withdrawing the spinal marrow” [of a turtle.]† “The presence of the spinal marrow is essential,”‡ [to muscular contraction;] it ceases on removing the spinal marrow”§—attaches itself to any part of an animal, the corresponding portion of the brain and spinal marrow of which is entire.”|| “The reflex function consists of impressions carried to and from the medulla”¶—“first pursuing an *arrière* course to the spinal marrow, being afterwards reflected upon the muscles,”** “incident into the medulla, reflected from the medulla.”†† A horse was knocked down—the cornea pricked—the orbicularis and abducens contracted; whereupon Dr. Hall philosophises thus: “There can be no doubt that a filament, &c., conveyed the impression to the medulla oblongata. All this is wonderful, and I believe, hitherto quite unknown to physiologists;”‡‡ [the reflex function is] “some mysterious influence”—[how then, a perfect discovery?]; “another fact,—the whole tone of the muscular system is the result of an excito-motory function.—The limbs of an animal, or of a part of an animal separated from the influence of the cerebrum become relaxed, on destroying the spinal marrow.”§§ “I gently withdrew the medulla and brain” [of a turtle.] “All the phenomena,” [i. e. muscular contractions,] “ceased—no movement followed;”||| “the limbs were no longer obedient to stimuli, and became perfectly flaccid, having lost all their resiliency. The sphincter lost its circular form, becoming lax, flaccid, and shapeless.—The tail was flaccid and unmoved on the application of stimuli;”—“proves that the presence of the medulla is necessary to the contractile function,—the reflex character of this property,” [and,] “that of the tone of the limbs, &c., depend upon the medulla spinalis,—effects not hitherto suspected by physiologists.”¶¶ The author asserts “that the phenomena detailed, subsist in distinct portions of the medulla”—“distinct and separate portions,”—which being destroyed, the corresponding portions of the muscular system deriving nerves therefrom, will be no longer contractile, etc.*** Dr. Hall’s next work, *Memoirs on the Nervous System*,††† is but an iteration of those previously cited.†††† The neces-

* Documents, &c., 1839. † First Com. Zool. Soc., Nov. 27, 1832. p. 136.

‡ Doc. 137. § Ib. 138. || Id. ¶ Ib. 142. Second Com. Zool. Soc., Aug. 12, 1834. ** Ib. 143. †† Ib. 144. ††† Lect. Nervous System, 1836, Phila., 33, 34. The fact here given does not justify the conclusion. §§ Ib. 40. ||| Ib. 41. ¶¶ Ib. 42.

*** Passim.

††† Lond. 1837.

†††† “This practice of constantly repeating himself, is a striking illustration as well of the irresistible tendency to self-glorification, so characteristic of Dr. Hall, as of the comparative barrenness or limited range of his intellect. Perhaps there never was an author who persisted so perseveringly and systematically in thrusting in the same things, over and over again, &c.” (*Brit. and For. Med. Rev.*, Jan. 1847.)

sity of the *integrity* of the spinal marrow in order to muscular action, with the incidental question of originality of the discovery, are the leading topics of this work.

The following passages, cited from Dr. Hall's work on the Reflex Function, published in 1833, will be found in the Medico-Chirurgical Review, for July 1834: "There are four modes of muscular action,—1, voluntary; 2, that of respiration; 3, involuntary; a *fourth, excited* by the application of stimuli, which are not, however, applied *immediately* to the muscular or nervo-muscular fibre, but to *certain membranous parts*, whence the *impression is carried to the medulla, reflected, and re-conducted to the part impressed*, or conducted to a part *remote from it*, in which muscular contraction is effected"—"in a curved, reflex course—requiring the *connection* with the medulla to be *preserved entire*." The third kind of muscular motion, the involuntary, he calls *irritability*, of which he gives this definition,—"The movements of irritability are the result of the *immediate* application of a stimulus to the nervo-muscular fibre *itself*." "The reflex function is different; its seat is in the medulla—*ceases* when *it is removed*."

In the last edition of Dr. Carpenter's esteemed work on Physiology, published in both England and America, during 1846, it is said in relation to the reflex doctrine, that, after the brain of the frog is cut off, muscular contractility remains, whereupon, the following explanation is given: (the Italics are chiefly mine.) "We are *not* to suppose that the stimulus *acts at once upon the muscles*, without the nervous system being concerned at all; throwing them into contractions by *direct influence*. For it is quite *certain* that unless the nervous trunks remain *continuous with the spinal cord*, and unless the part of the spinal cord with which they are connected remains *sound*, *no action* will be the result. If the trunks be *divided*, or *either* of the roots by which they are *connected with the spinal cord be severed*, or the lower portion of the spinal cord itself be *injured*, *no stimulation* will cause the muscular movements;* "if the anterior roots be touched, contractions are immediate—*if divided*, *no such a result* follows, whatever amount of irritation be applied—if the posterior roots be touched, no vigorous muscular contractions, the movements are evidently of a reflex character, being called forth by the anterior or *efferent roots*."†

The reflex-neurologists, fail utterly, in showing any positive or even probable connection, as cause and effect, between their experiments and theory. The vast assemblage of physiological and pathological phenomena, which they claim as having been explained in the clearest manner by these experiments, have not been traced link by link, either in the ascending or descending series; their order, uniformity, succession, antecedence, sequence, have not been ascertained and made known, with the concurrent, but unessential concomitants and co-incidents; their pathological anatomy, whether *material or immaterial*, has not been plainly traced to these experiments. Indeed, no material or immaterial morbid anatomy of the spinal cord, the seat of so many diseases has ever been given, or even described, and, yet there must be in this cord,

* Phys. 236.

† Ib. 502.

a change for every malady. What are the spinal anatomical characters of hæmorrhage, or hydrophobia,—sterility, or strangury,—paralysis, or passion,—asthma, or abortion,—tic, or tetanus,—all spinal in their location? Now, I lay it down as an axiom in morbid anatomy, that no great and important tissue or organ of the whole body, presents on an average, so *few well marked structural alterations*, as the spinal marrow, provided it be examined in its *material form*, from one to six or even twenty-four hours after death, leaving out immaterialities, incorporealities, and spiritualisms. In fact the *spinalists* have been an unsuccessful sect. Le Gallois, (the date of whose publications on the vital functions of the cord, is not precisely recollected,) early in the present century, claimed the medulla spinalis as the source of life to the entire trunk, as well as the exclusive seat of sensation and motion, all being independent of the brain! The cord ought to be the focus of morbid alteration—if anatomy have any thing material in it, as some people have supposed in their simplicity and ignorance. Its physiology, I repeat it, is still more obscure than its anatomy. No one will pretend that there is anything in the physical structure of the anterior roots, by which motion can be recognised or inferred as a nerve-property. The physico-analogical argument is against the supposition, and still the more so when the roots are supposed to communicate to the muscles a power, which they themselves do not possess in virtue of any special physical, or anatomical adaptation. I do not positively deny that the anterior roots exercise an influence upon muscular motion during life, but, I contend, that their influence as the exclusive motory force or agent, is not proved, is not even probable, while the muscles do possess adaptations in size, strength, direction, origin, insertion, and mechanical contrivance, every way adapted to act in the most independent manner as motors, as far as any one tissue can lay any claim to independence.*

John Hunter's massiveness of intellect, enabled him in a great degree, to resist the momentum of mere theory. He spoke but the language of common sense, when he declared in his lectures on surgery, that "much more has been given to the brain and nerves than they deserve. They have been thought to be the cause of every property in the animal body; that independent of them the whole body was a dead machine, and that it was only put in action by them. But although their actions are absolutely necessary in the machine, they are not so universally so as has been imagined. They are not the cause of growth, nor do they even preserve a part from death, although the whole as a whole cannot live without them."

The reflex theory, including Bellism, unlike every other theory, has not a single, clear application in practice. Humoralism appeals to chemistry, and solidism shows disorganizations, but the reflex doctrine,

* Englishmen, ought by this time, to know something of muscular motion, as Dr. Croone, who died, in 1684, bequeathed not only money, but the profits of a house, for annual lectures on that subject. The Croonian Lectures on Muscular Motion have continued 163 years! Many rich prizes, in both Continental and Insular Europe, are awarded annually, for similar purposes. It is easy to swim when held up by the chin!

nothing. In dysentery, consumption, croup, pneumonia, the alterations are palpable, and the treatment can be directed upon intelligible principles; but the reflex pathology and therapeutics are wholly unknown;—perhaps, this is the proper method of managing immaterialities, that is, to know nothing about them; and yet, we are told that “the material studies of medical men, as humoralism, pathology, anatomy, and chemistry, render the mind inept” for the sublime study of the *true* spinal cord! The consequence is, that “these material studies,” should be banished from our medical schools, as “they render the mind inept” “to the second great discovery.” Which college will set the example?

It is owing to these visionary theories which promise so much and disappoint the student’s expectation, that so many turn out of the right way into the paths of quackery. Faust studied theory profoundly until he lost confidence in practice, and while the people were praising him and his father, for their great success in curing fever, he exclaimed—“thus did we with our hellish electuaries, rage in these vales and mountains far worse than the pestilence. I myself have given the poison to thousands; they pined away, and I must survive to hear the reckless murderers praised;”—he therefore, soon renounced both the theory and the practice: “I no longer fancy I know anything worth knowing.—Then I have neither land nor money, nor honor, nor rank in the world. No dog would like to live so any longer. I have therefore devoted myself to *magic*, * * * and drive no longer a paltry traffic in *words*.”

The reflex doctrine “is the second great discovery, destined to revolutionize the science of medicine,” or it is a great error destined to consume, without any compensating advantage, much of the student’s valuable time,—to lead him into a fallacious method of experiment and of reasoning, and to mislead in both the theory and practice of his profession. Taking this latter view of the matter, and believing that every cultivator of science is bound to do all the good he can in the discovery and diffusion of the truth, as well as in the correction of erroneous principles, and believing, moreover, that the reflex neurologists, cannot be understood, simply, because they do not understand *themselves*, I will indulge the hope that the reader will not attribute to me unworthy motives, whatever errors may be committed in this discussion.

Is it modest in reflex-neurologists to affirm that they are fifty years in advance of their age—fifty years before their ignorant, ungrateful cotemporaries—fifty years before our unworthy planet was ready for their advent? And what have they done? Reflected a reflection:—Reflected an opinion—the hypothesis of another. “Opinions formed from opinions—what are they but clouds sailing under clouds, which impress shadows upon shadows.” These theorists would, by their illusions, convert the fair field of science into a sterile waste. **THE REFLEX-MIRAGE**, like that in the deserts of Africa, presents flowery meadows, pure fountains, and hospitable dwellings where none actually exist.

The ink with which the last sentence was written, was scarcely dry, before the last number of the *Lancet* was received, in which it is proposed to examiners, to *require all candidates to be examined in the reflex theory!** Innocent youths, never yet guilty of a homicide, *secundum*

* June number.

artum—candidates for M. D.—who have learnt in the *Lancet*, that not one of the Royal Society, (the most learned in Europe,) understands the reflex discovery, (its inventor excepted)—these poor lads are required to comprehend that which the gray beards themselves cannot.

* * * * * The sun had gone down upon the earth. The moon was mounting above the plains of Louisiana, while many reflex-moons were dancing upon the turbid waves of the Mississippi, which rolled noiselessly beneath my window. The pendent gray moss, a parasite of the cypress forest which overlooks the city, now blackened by night, waved silently in the breeze. I fell asleep, as soundly as John Bunyan while writing the *Pilgrim's Progress*. I dreamt I was a young man, walking thoughtfully upon a shore, but whether it was the shore of the Mississippi, the Chesapeake, the Hudson, the Thames, or the Seine, I could not tell. Hardby arose a great temple, whose spire pierced the clouds. It was the medical college, wherein I was going to be examined for the degree of M. D. I feared the ordeal. Every artery of my head throbbled. I hastened to my room, to review my studies. The sciences, one after another, passed before my mind. Surgery with his catlings, scalpels, and saws—chemistry with its crucibles—obstetrics with her screaming infants! To the dead body I was perfectly at home. I marched up to a skeleton, in my room, and struck it with defiance! Dry bones, I know you all! The skeleton grinned! A voice came from its hollow skull. REFLEX! REFLEX! REFLEX! I was once a student, but the nerves distracted me—turned my brain. "I sought the bright day, and with an ardent longing after truth, went miserably astray in the twilight."—Beware of the reflex function, for even the Royal Society cannot, the Reflexians do not, and the students should not, understand it.

As the present paper is but the hasty sketch of a rambler in the realms of neurology, and not a systematic effort, I may with the more propriety introduce, here, a few supplemental observations belonging to an era anterior to that of Whytt, Prochaska, and Haller, which will serve to illustrate the earlier doctrines of contractility and of the nervous centres, with a glance at the ganglionic system of nerves as explained at a later period by the illustrious Bichat, and by the learned Dr. Copeland, a quarter of a century ago, and still adhered to by him, together with some experiments performed while these sheets were passing through the press.

A correct history of the medical theories of the 17th and 18th centuries would be little more than an account of the doctrines based on muscular contractility, under the terms *contractilitas*, *irritabilitas*, *vis vitalis*, *vis insita*, *vis motoria*, etc.

Glisson, (born 1597, died 1677,) studied the muscular system with great care, and was the first to discover and name its most characteristic and peculiar principle, namely, *irritability*. From the muscular fibre he ascended to the principal organs, noticing the distribution of irritability to each, generalizing the whole into "natural, vital, and animal. 'It is hardly comprehensible,' says Sprengel, 'how this lucid and excellent notion was not accepted with greater alacrity, and further unfolded by cotemporaries.' It has, however, since, been universally adopted; though the explanation hitherto offered, of the way in which the nerves

operate on this irritability, and discharge their other offices, present only a series of hypotheses. Glisson assumed the existence of certain vital spirits,—a mild, sweet fluid.* Cuvier,† in reviewing Glisson's researches on this subject, regards him as the founder of nearly the whole system of physiology of the 18th century. It is not a little curious, that the illustrious Frenchman himself, whose vast erudition and massiveness of thought would seem guarantees against theoretical puerilities, should have adopted Glisson's doctrine of innervation. For although Cuvier does not use the words "vital spirits, mild, sweet fluid," he adopts the hypothesis of "a nervous fluid,"‡ adding to this several other assumptions, still more incomprehensible, as will be seen hereafter, forming the strongest possible contrast to that ingenious, but in no respect peculiar, generalization of his, namely, "Natural History has a principle on which to reason, which is peculiar to it—that of the *conditions of existence*, commonly termed *final causes*—nothing can exist without these;—the component parts of each must be so arranged as to render possible the whole living being, not only with regard to itself, but to its surrounding relations. The analysis of these conditions frequently conducts to general laws, as demonstrable as those which are derived from calculation or experiment"§—a proposition which rests chiefly upon *à priori* and synthetic reasoning, but which at the same time borrows or rather steals much from the experimental and inductive method. At least, few can make any sure progress in philosophizing in this manner, without being deeply learned in the experimental school. Cuvier, for example, infers the structure of the viscera of an unseen animal, from its claws or teeth, upon the doctrine of adaptation, or what he calls the conditions of existence, implying contrivance, purpose, end.

The authors of the Bridgewater Treatises, who, under the assurance of a heavy golden consideration, wrote to order, to prove the power, wisdom, and goodness of God in the Creation, proceeded generally upon this principle of adaptation,—a principle which is displayed in the muscular system to an extent not equalled in scarcely any department of nature they have investigated, and which even Sir Charles Bell, in his treatise on the Hand, its Mechanism and vital endowments, as evincing Design, does not enter upon as fully as its importance demands. It is not a little curious, that St. Hilaire who wrote about the same time, maintaining the *Theory of Analogues* and the doctrine of Unity of Plan, in even the Organization of Monstrosities, (views that would seem to harmonize with those of Cuvier, as well as of those given in Bridgewater Treatises,) repudiates, nevertheless, all such purpose, end, aim, intelligence, &c., as hypothetical: "I take care, says St. Hilaire, not to ascribe to God *any intention*—*Je me garde de prêter à Dieu aucune intention*. I ascribe no intention to God, for I mistrust the feeble power of my reason. I observe facts merely, and go no further. I only pretend to the character of the historian of *what is*. I cannot make nature an intelligent being who does nothing in vain, who acts by the shortest mode, who does all for the best." Now from the muscles of the foot to those of the eye, the adaptation of the means for the attainment of the

* Whewell Hist. Induc. Sci. iii. 427-8.

† Hist. Sci. Nat. ii. 434.

‡ An. King. 23.

§ An. King. 23.

end, is indubitably clear ; the intention or purpose of nature is obviously developed. The most complicated motions of the hand, for instance, can be traced to the combined actions of appropriate muscles, while in neither the individual nerves of the part, nor in the assumed imponderable fluid, can there be traced by experiment or analogy, any organization or conditions of existence, specially adapted to the infinitesimal varieties of muscular motion. In fact, the function and the organization go hand in hand. If the fibres of a particular muscle be radiated, penniform, orbicular, or rectilinear, the contraction will correspond, whether excited by a blow, a cramp, or a volition, while the nervous cords present no organization, no action, no adaptation of this kind. It is here, if any where, that what is, serves to conduct to the wherefore, the result, the end, the purpose.

Glisson more than a century before the era of Haller, developed the great principle of muscular *irritability*, while an Italian cotemporary made great advances in unfolding its mechanical details or effects.—This was the celebrated Borelli,* who maintained that the muscular fibres were hollow cylinders like a chain of minute bladders. He was the first who seriously applied mathematical calculation to explain and to estimate the muscular force. He was the first to demonstrate the principle, then little known, namely, that nature had guarded *against* that arrangement of the muscles which *economises* the muscular power, so that much of this power is necessarily lost, and that it is, in fact, much greater than it appears to be,—the muscles being inserted, not perpendicularly, but obliquely, at an unfavorable angle, and into the most disadvantageous points or ends of the bones or levers to be moved ; the power being remote from the resistance,—all of which is now well known to every physiological anatomist acquainted with animal mechanics. Borelli showed, nevertheless, that this arrangement of the muscles combines advantages greater and more varied than is attainable by any other. His generalizations gave a new impulse to the Mathematical School of that day,—a school that sought to explain, upon mathematical principles, not only the animal forces but the whole science of medicine—a school which Pitcairn,† a Scot, subsequently labored with zeal to advance, particularly in a work of his under the imposing title of *Elementa Medicinæ Physico-Mathematica* !

Haller,‡ a Swiss, the morning star of modern physiology, recognised under the terms contractile power, irritability, *vis insita*, &c., an enumeration of phenomena, throwing a greater luminosity over this entire field of inquiry than any other preceding writer. It is evident, that he knew nothing of post-mortem contractility in the manner and form which I have described. The *vis insita* “is according to him excited by a sharp instrument—*oscillates to and fro* ; at one moment it contracts itself towards the middle and at the next, extends itself from the middle towards the extremities, and so on for several times.” (*Phys. cccc.*) In a word, Haller knew, that with a sharp instrument, a delicate ridge could be produced, the summit of which oscillates, but soon flattens down, and may be reproduced, as he says, “for several times.” Now this cannot be called a functional action, as the flexion of a limb. The

* 1608–1679.

† 1652–1713.

‡ 1708–1777.

action which he describes as being "more powerful than any other is the stimulus of electricity," and says, that violent *convulsions* can be produced in the muscles through the nerves of the spinal cord. (cccciii.) Now this *vis insita* or *irritability* as he knew, it was referred not to the nerves or "nervous power," as he termed it, but to the muscle itself. Here lies the merit of Haller, not so much in proving and developing the phenomena, as in announcing the true principle. He relies, it must be confessed, almost wholly upon the heart and intestines for his proofs, asserting that "they are exceedingly tenacious of their *vis insita*." (ccccii—ccccix.)—organs wherein I have never been able to detect, in the human subject, any thing of the kind, except a delicate ridge from scratching the surface of the heart. From half an hour to later periods after death I have searched often, but in vain, for any other motions. Bichât, during the Reign of Terror, received from the authorities decapitated criminals, for experiment, in from 30 to 40 minutes after death, but was never able, by even Galvanic electricity, to produce motion in these organs.

Cuvier criticises Haller for ascribing irritability to the muscle, as a property independent of the nerves—a theory which he pronounces very weak.* Yet Cuvier at the same time admits, that in many animals wherein no nerves can be discovered, muscular motion exists, as among the *Zoophytes*, and especially the *medusés*. The weakness in this case is not with Haller. Cuvier with all his greatness, sometimes adopted theories not at all tenable, especially in neurology. Thus he considers, "the nerves the cause of [muscular] contraction." He next assumes the existence of "a nervous fluid derived from the blood and medullary matter which secrete it," and says, this "cannot be doubted!" He then finishes his circle of assumptions by stating "that it is by an imponderable fluid that the nerve acts upon the [muscular] fibre."† Here, without a particle of proof, one improbable assumption is offered to prove and explain another still more improbable, until the subject becomes absolutely inconceivable, not to say absurd, and judging by analogy, impossible. For, by no law, by no analogy, no adaptation, no plan, can the imagination itself connect as cause and effect any fluid whatever, in locomotion, respiration, sensation, thought. To say water will run down an inclined plane to seek its level, or that caloric will cause expansion is comprehensible, but to aver that an imponderable fluid, that is, a fluid the weight of which cannot be appreciated by our present imperfect instruments, can in virtue of any special organization it possesses, communicate to the nerve, and the nerve to the muscle, all the motory variations in painting, in dancing, in running, in fencing, in singing an opera, &c., is to adopt a method of explanation which is directly opposed to that profound intellection and rigid induction which Cuvier generally displayed and for which he is justly admired. Haller wisely refers "the motive cause to a law established by the Creator;" (ccccviii.)—though philosophically speaking, this is only a provisional reference—a confession of ignorance—a leaving of the question open, unencumbered by theoretical trammels, and not as some imagine to silence inquiry, or to intercept further efforts to rend the veil which now

* Hist. Sc. Nat. IV. 233.

† An. King. 23, Lond. 1840.

hides the truth and which prevents further advances. But the most extraordinary part of Cuvier's series of assumptions remains to be told, namely,—“sensativeness and muscular irritability, are so much the stronger at every point, in proportion as the exciting cause is more abundant, and this agent is the nervous fluid, &c.” Now, I have shown that the muscular force is not even diminished by destroying the nerves.—There is, indeed, no ratio between the amount of nervous matter and the amount of the muscular forces. I could illustrate this principle in the living body, in its normal and diseased conditions: one example will suffice. Many anatomists, especially before Scarpa's time,* maintained that *no nerves whatever entered into the tissue proper to the heart.* Professor Duglison† regards the nerves, especially the cerebral, as exercising but a very limited and indirect action over this great organ. Digitalis may diminish—exercise, fever, and mental perturbations increase its action, but from the first to the last moments of the longest life, its motion is perpetual. Answer, ye who slight the muscles and idolize the nerves, how comes it to pass that the very organ which is the *poorest in nerves* should be the *richest* in the muscular force? Has any dissector ever shown any morbid change in the nerves of the heart, even in angina and maladies unmeaningly called nervous? Are not nearly all diseases of the heart, as induration, softening, hyperæmia, atrophy, dilatation, enlargement, muscular? Ask the morbid anatomist. Probably most cases of palpitation, angina pectoris and the like, are attributable to spasms or convulsive cramps of the muscular tissue of this organ.

Certain it is, that the heart's action is not in a ratio corresponding to its nervous matter. Borelli's estimate, (doubtlessly an exaggerated one,) represents the force, in the left ventricle alone, as equal to 180,000 pounds! The muscular force of the uterus is in no respect proportioned to its quantum of nervous tissue. Its irregular actions in rupture, abortion, hour-glass-contraction; its hyperæmias, its scirrhus, and other degenerations, belong to the muscular rather than to the nervous texture.

The beau Ideal of the physical man, the Sampsons of our race, possess brawney masses, prominent muscular developments, with the brain and nervous matter and the intellect and the sensibility minimized—without longing after immortal fame—without genius and without taste in the fine arts—having much animal, but little moral courage. On the other hand, a great development of the nervous system, large brains, intellectual superiority, exquisite sensibility, taste and genius seldom appear in a man possessing Herculean muscular strength. With respect to this particular, who can believe that Homer and Milton, Shakspeare and Voltaire, Rousseau and Pope, were equal to the ancient *Athletæ* as wrestlers, or to the modern boxers and tumblers in muscular action? The Cuvierian doctrine, that muscular action or irritability is proportion to the nervous matter, its agent, is the reverse of the general opinion and the general experience of mankind, and contrary to Cuvier's own statements elsewhere. He asserts that no quadruped approaches man in the magnitude of his brain,‡ but that he is inferior to animals in

* 1746-1826.

† Phys. ii. 146, et seq.

‡ An. King. 46.

strength and swiftness,* that is, in muscular force. Hence the rule, to which the exceptions are few, namely, the muscular and nervous systems are in the inverse ratio to each other, and not correspondent.—Coleridge asserted that in the features of every man of genius there is something feminine.

The obliquities in the logic of the nervous system, but too truly represents those in its anatomy, physiology, and morbid action. M. Sarlandière, in one and the same page, says that “the principle of motility resides in the spinal medulla, which is the reservoir of *innervation*, of nervous power for the ganglionic system”—of which latter, he maintains, that “all the nerves of the life of relation entering the ganglia are sensible—all passing from the ganglia are insensible; that they intercept the cerebral nervous influence, and are found in all animals having a distinct nervous system, constituting that of the invertebrated exclusively.”† Now if we turn to Cuvier’s work on the Animal Kingdom, his second great Division will be found devoted to these animals, which he groups in six classes, with many orders and families, and, which he describes thus: “their nervous system does not unite in a spinal cord, but merely in a certain number of medullary masses dispersed in different parts of the body. Their irritability is very great, and is retained a long time in parts after they have been amputated.”‡ Neither the existence of the spinal cord, nor a great quantum of nervous matter is necessary to a great muscular force.

Prelusory to a few remarks concerning the sympathetic nerve, including the ganglia, plexuses and their supposed functions in presiding over the involuntary muscles, circulation, nutrition, secretion, and absorption, it may be proper to say, that while Glisson was engaged in disseminating the doctrine of *irritability*, his compatriot, Willis § was engaged in propagating the Doctrine of the Nervous centres,—the ganglionic masses, and, indeed, the distribution and configuration of the entire nervous skeleton.

As the summit of the loftiest mountain is the first to receive and reflect the morning light upon the dark plains below, so Bichat’s towering mind received and reflected the medical glories with which the Nineteenth century opened, and which the bright emanations of his own genius increased and concentrated. But his brief life passed away like a meteor, leaving however an enduring track of light in the medical heavens.||

Paradoxical as it may seem, it is nevertheless true, that Bichat’s most erratic speculations and the least sound of his generalizations are more or less valuable, because they are suggestive, and serve as starting points for the inquirer. An original observer, an original thinker, the massiveness and the multitude of his ideas, like a crowd hastening to pass through a narrow door-way, embarrassed each other. An enemy to mere words and metaphysical abstractions as exponents of things, he generalized without limit. Was there ever before any book so excessively generalized as his “*upon Life and Death?*”

Bichat’s theory of the nerves, especially of the ganglionic system—its insensibility, independence, and involuntary action, is of great impor-

* An. King. 45. † Anat. passim. ‡ 335. § 1612-1675. || 1771-1802.

tance, as serving to classify a very peculiar and extensive group of phenomena, over which he supposes the sympathetic nerve presides.— Now if the heart or some other organ shall be found to exercise this assumed control, the leading conception is not the less due to Bichat.

According to Bichat,* the nervous matter constitutes two distinct systems, whose functions have but little in common. The Sympathetic is a separate system, emanating from the ganglions, each of which has a distinct and independent action. This system he calls the organic, ganglionic or sympathetic which has numerous centres in the ganglia, greatly differing from the cerebro-spinal which has but one centre, that is, the brain. Whether the marvellous influences of Ether, lately discovered, act through the blood, the nerve, or the muscle, may not be evident, but one fact appears to be, if not established, quite probable—a fact favoring Bichat's views of the independence of the sympathetic, namely, that the organs supposed to be under the influence of the latter, are the least and the last to suffer, from etherization;—though many of the reflex school are making haste to appropriate these ethereal phenomena to their theory. The reflex anatomy and function of the spinal arcs are alike obscure, especially in parturition, where they are supposed to be the most clear. If the uterus be exclusively under the control of any great division of the nervous system, it ought not to be that of the cerebro-spinal, but that of the sympathetic, whence it derives its principal nerves, that is from the renal and hypogastric plexuses. If the nervous texture of this organ be nothing else but a portion of the spinal arcs, why does not etherization intercept its motory as well as its sensory function, as in other arcs? If the ganglionic and every other nervous influence as the primary controlling power of the affiliated organs of the centre, be rejected,—if the doctrine of a special, yet common organization and function be assumed, as necessary to and inherent in all, as an ultimate fact beyond which it is impossible to look,—in either case, the fundamental idea of Bichat, that is, independent action is, to a considerable extent, countenanced by etherization. I may remark, however, that the great precision—the mathematical exactness with which the action of ether has been traced and described, must be viewed with the greatest distrust by all, not partizans, who have studied with care the uncertainty with which such physiological, morbid, or medicinal actions are enveloped.

Dr. James Copeland's exposition of the ganglionic system, (differing but little from Bichat's,) given more than a quarter of a century since, and now reinforced by the late approval of the author, becomes the more important from the fact that it contains a reflex doctrine. Dr. Copeland says, "the phenomena which Dr. Hall has assigned to a reflex function of the spinal cord, were fully recognized by Whytt. Reflex actions, I denominated many years ago, (1824,) *reflex sympathies*." Dr. C. contends that Dr. Hall has only dignified with the term function what had long before been called reflex sympathy. The former attributes reflex action to the ganglionic, the latter to the spinal system.† Dr. Copeland so far from limiting reflex sympathy or action to the brain or spinal cord, or to both conjoined, refers it chiefly to the organic or

* Life and Death.

† Lancet, for January and March, 1846.

ganglial nervous system, affirming from experiment, that after the division of the spinal cord, "galvanic currents through the sympathetic ganglia, affected the muscles both below and above the divided portion of the cord." "As the ganglia of the great sympathetic form, says Dr. Copeland, an independent system, presiding over certain functions which are essentially vital, consequently, they may be viewed as the system and seat of organic life, and may therefore be denominated the vital system of nerves, whose centre is in the semilunar ganglion. The vital influence being thus produced from the centre of the body, and reinforced and modified by subordinate ganglia, allotted to the individual organs, according to their functions, is propagated along the distributions of the system on which it depends and is inherent, throughout the whole body."* "Contractility," he continues, "is essentially a vital phenomenon. This property may be divided into *insensible organic contractility*, into *sensible organic contractility* or irritability, and into cerebral contractility," or "the contraction occasioned by the will in the voluntary muscles. The first and second species result from the ganglial distribution and influence."†

Dr. Copeland maintains that "the ganglionic nerves do not originate either from the brain or spinal marrow:—because they are observed in the lowest animals which possess neither brain nor spinal cord,—because they may be distinguished in embryos before either one or the other nervous mass can be traced, and because they are never wanting in the fœtal state,—whereas not only have the brain and spinal marrow been individually wanting, but the same fœtus has been found entirely without both."‡

Dr. Copeland denies "the existence of a peculiar structure or mechanism set apart for the reflex or excito-motory actions, as Dr. Hall believes."§

Of the Reflex discovery, the *Lancet* affirms, "there is nothing so original, diffusive, developmental, grand,—it will deliver our art from the hands of the ignorant—bring certainty out of chaos—revolutionize physiology, pathology, remedies—and is the key, the corner-stone, the basis of scientific midwifery," while Dr. Hall asserts that this system "is as definite as the action of the ordinary ray." These are great discoveries, if any body could understand them. It is with despair that a plain man reads in the *Lancet*, that these things are too high for any intellect save that of Dr. Hall. "We know, says that journal, of *none* except Dr. Hall himself by whom the spinal functions, and the spinal marrow are *fairly* treated of." Now this kind of argument is well known among the Indian tribes of North America. No one dares to know as much as the Medicine Man. His Medicine-Bag is more wise than any other. There is, fortunately, a greater doctor than either of these, namely, common sense. What he cannot understand is no discovery at all.—Nor can he be frightened the by words *physical, dynamical, imponderable, reflex, excito-motory, &c.*

In the dark ages, words were more potent than at the present era. In the 11th and 12th centuries, the State, the church, the learned—were divided between Plato and Aristotle, or the Realists and the Nomi-

* Doc. 166-7; Read, 1820. † Ib. 169,170. ‡ Ib. 156. § *Lancet*, 1846.

nalists. The former believed that words, or rather ideas have a proper or independent existence, being realities, true entities, but without souls; the latter, that general ideas are nothing but abstractions, or intellectual results deduced from sensations. Bitter was the dispute—fiery was the persecution—and violent were the shocks, when one half of christendom arrayed itself against the other, about a word, an abstraction,—whether an idea was an entity, a reality, or but *flatus vocis*—whether, *qui in rebus, non in vocibus, verum positam esse?* The Nominalists failed according to D. Stewart, because they had no experiment or palpable example by which to illustrate their doctrine of the real and universal function of words, in opposition to things. The same failure awaits reflexism. One of the greatest merits of Bichat, was his rejection of metaphysical abstractions as exponents of physiology. The Reflex abstraction, under all its metamorphoses, throws no light whatever upon, nor has it any connection with, any branch of medical science, being an idea, a word, not a thing,—not physical, but phantasmagorical,—not light, but a cimmerian darkness. “The Germans, says a wit, possess the faculty of making the sciences inaccessible.” So does the reflex school.

A true history of the world would be, not so much a relation of the acts of kings and cabinets, of generals and of armies, as of *Words*.—Aristotle’s ten categories reigned longer, more extensively, and more despotically than the Twelve Cæsars. “The majority of mankind pay an habitual veneration to words, and this species of adoration is not exempt from fanaticism. It would not be difficult to find men who would willingly suffer any privations and tortures, an even death, for *words*. And it is almost always for want of attaching *the same ideas* to the *same words*, that men misunderstand each other, dispute, and sometimes come to blows.” Words, in every age, have reigned in Medicine.

“Allow a man, says Berkeley, to make his own definitions of common words, and it will be no hard matter for him to infer conclusions, which in one sense shall be true and in an other false, at once seeming paradoxes and manifest truisms.” Admitting, provisionally, the truth of the Reflex discovery,—does it belong to Nominalism, or to Realism? Is it a real, proper, independent entity, or an abstraction—a thing, or a word—Dr. Hall is aware that the *true Spinal System* is but a cadaver without a soul, when separated from the word *reflex*. He, therefore, idolizes that potent word. I will not say that he would, the law permitting, like the Realists put dissenters to the torture, though he and his friends do even now, in this age of toleration, go as far as the law will allow—nay, a good deal beyond it.

In a late communication in the *Lancet*, having for its title, “*The Anatomy of the Excito-Motor System*,” Dr. Hall exclaims, “how much, then, is conveyed or implied in that one word *Reflex!*” Without intending any persiflage, I may mention a true story of a certain clown, who was unacquainted with the reflex laws of light, and who, having as he supposed, a real moon in a bucket of water, killed his jackass, for drinking up the same, though the poor beast had done nothing but drink the water which reflected the moon. “But how much is implied in that one word *Reflex!* It performs in the excito-motory system, all the mysterious functions of the Zodiacal Man, pictured in the Almanac. Whether

“internality or externality, subjectivity or objectivity,” or some other Germanism can reveal its hidden meaning, is doubtful. But the most difficult part of the inquiry is, to ascertain whether it applies to a material, or an immaterial entity, as constituting this discovery, the evidence being about equally balanced: For, although, “the material studies of medical men, as humoralism, morbid anatomy, pathology, organic chemistry,” are denounced as pernicious, the language used by that school is of the most materializing character; “*true spinal marrow, distinct anatomy of the excito-motor system, arcs,*” and many terms, tests and properties indicative of materiality, are used. The spinal cord is surely as material as the great wall of China, but a *true* spinal cord is not quite so clear in meaning, but Mephistopheles says, “we must not be too anxious about that, for where the meaning fails, a word comes in most opportunely.” Is not that *esse substratum* or *something* which goes, comes, has incidence, reflection, “which is physical in its nature,” which has curves, a distinct anatomy,” and many attributes of matter, as much matter as the pyramids? It is to no purpose to talk of particles, fluids, and the like, or even of “dynamics.” Mere abstract power which is described as being of a physical nature—as being also fully discovered, mapped out, and made known, without having at the same time substance or a substratum in which it inheres as an attribute, is about as obscure an idea, as ever turned up in the sea of dreams.—Power as a separate entity, is not as “distinct in its action as the ordinary ray.” “Power, says Dr. Reid, is not an *object* of our external senses, nor even an object of consciousness, but a relative conception,—a quality, and cannot exist without a subject to which it belongs. That power may exist without any being or subject to which that power may be attributed, is an absurdity, shocking to every man of common understanding.” Though this may be an extreme view, yet whatever may be the reflex thing, entity, light, or power, its material or immaterial form, its course, or curves in going to, being pictured upon, and returning from the reflector, or *true* spinal cord, none of these could be seen or appreciated by the senses, inasmuch as “the mysterious messenger” would be masked and concealed in the midst of opaque muscular, bony, and nervous masses. Its exact route, could not be seen nor mapped off. The inductive philosophy is too *naïve* to permit “the lynx-eyed Dr. Hall,” as the Lancet calls him, to impose on her a mere abstraction, for “the second great discovery,” having “a *distinct* anatomy, reflex arcs, animal dynamics, mysterious messengers,” which by the new *regulæ philosophandi*, are immaterial yet “physical in their nature, reflex in their action.” Now when a plain man cannot comprehend all this, he is gravely told that “the difficulty lies in the inductive nature of the thing itself,” or, in other words, that he is ignorant of the inductive philosophy, that is, of common sense, and is only fit for the execration of future generations, as “a laggard and an obstructor of the truth.”

It has been already shown, that the excito-motory “meaning of the word *reflex* is not *figurative*, as in politics and morals,” but *literal*, “*physical*,” and that no one had discovered or used it, in this sense, before Dr. Hall. This he insists on in his last paper in the Lancet: “The terms incident and *reflex* imply a *real phenomenon* of the most remarkable kind.” “There is, in these nerves, some *extraordinary*

recondite connection." "The superior laryngeal sends forth some *mysterious messenger*,—returns in the *just channels*." "Reflex function, with its *fulness* of meaning, had been used, *could have been used by no one*," [other than Dr. Hall.]

No one can tell whether the *true* spinal marrow is the reflex-acting matter itself, or a mere passive reflector, a receiver of impressions,—not *figuratively*, but *literally*, and if literally, how does the seal traverse "the reflex arc" to make its stamp on the medulla? Is the seal a self-moving one? Is its impression, one that can be seen? or must it be divined? Does it travel among transparent, or opaque tissues? Can one see "the mysterious messenger," going, and "returning in the *just channels*," and not in bye-paths? How does he travel? What is his velocity? Being a physical, not a metaphorical personage, what are his characteristics, distinctive features, natural history? Whatever this entity may be, "it claims," according to the *Lancet*, "to be a great discovery, and cannot descend to a lower title;" [though]—"the writers of the profession still go on writing, and their so called thinkers still go on thinking, as though the spinal marrow, as we now know it, had no existence." But let no one cry EUREKA! He cannot be sure, so long as the question of entity and non-entity, the literal and the metaphorical, the ranine and the human are jumbled together, and the more so, as "all material studies render men's minds *inept*" in this new science. Never was a system more obscure—data more inconclusive, hypothesis more unwarrantable;—in none have criteria, direct experimental proof, rational analogy, coherent, philosophical deduction, been more constantly avoided. Its "arcs," like mechanical arcs, serve but to illustrate the law in mechanics, *that nothing is stronger than its weakest part*.

It may be proper to say something of the luciferous argument, (*argumentum ad lucem*,) of the reflex school.

After a considerable slumber, the doctrine of Goethe—doubtless, at first, an ideal reference of his poetical mind, is attracting universal attention among physicians and naturalists;—I allude to *Metamorphosis* or *Morphology*.* The reflex theory seems to have taken for its *mor-*

* Morphology, with numerical averages, promises the greatest advantages to medical science, in solving many problems, beginning as it does, with elementary types, noticing progressive development from the lowest to the highest formations, it seeks to appreciate the circumstances which modify the primordial law of organization, the range of which is more limited than is generally imagined. One of the most remarkable, and, as yet, unapplied facts, going to show how a single circumstance may triumph over the apparently inexorable purpose of nature in maintaining the unity of organization, is found in that subterranean wonder of the world, the Great Cave of Kentucky. In the *New York Journal of Medicine*, about two years ago, will be found an anatomical discription of EYELESS ANIMALS, inhabiting that cimmerian region. The fishes of the river Styx, in this cave, have *no eyes*. An unbroken Night for countless ages, has, as it were, assumed the functions of the Creator! has annihilated one of the most important organs, because it was useless!

Would the great *Archæus* of the Kentucky Cave, restore the visual organs of these eyeless animals, upon laying open that vast realm to the light of day? The Kentucky philosophers have within their reach, in the great cave, what Goethe would call "*the sacred riddle*" of metamorphosis. If Darkness annihi-

phological type or analogue, LIGHT—a very lucid point of departure. If the germ be so bright, how much more so the fully developed form! The language is that of optics—*incidence, reflection, &c.*, and if the word *refrangibility* is not used, the word *curve* is. One would naturally suppose that these terms were used in a *figurative* sense, but such is not the fact. The Lancet says, “The term *reflex* was, it is true, used by some,” [before Dr. Hall,] “but it was in the same sense as the word is now used in morals or politics, as something secondary or dependent.” Dr. Hall says, “How much then, is conveyed or implied in that one word, *reflex,—incidence, reflexion,*” &c.; “the ordinary reflection of a ray of light, or the polarization of a ray of light, is not more *definite*,” “the ray of light, which is now incident, and immediately afterwards reflected, is the same ray, modified, directed, and returned by the *reflector*, whether it consist in locomotive particles, or in vibration.”

With respect to this new light, there cannot be much propriety in investigating its laws, so long as its *reality* as a discovery, is questionable.

Berkeley has well said, “it is to no purpose for *explaining nature* to bring forward what is neither *open* to the *senses*, nor can be understood by reason.”* Sir Charles Bell, (much as it was against his theory,) quotes and adopts Dr. Reid’s observation concerning the nerves, namely, that they are *unhandy engines* for carrying images, elastic ether, animal spirits, vibrations, tonicity, &c.† How much more “*unhandy*” is the “*true*” spinal marrow for a looking-glass,—not a *figurative*, but a *literal reflector*! “definite as the ordinary ray.” By which of the five senses may this “mysterious messenger,” the morning star, the harbinger of that effulgent day long prayed for by the Æsculapians, be recognized? Can the material eye trace its self-luminous path, its rectilinear, refrangible, and reflex actions—its divergencies, intensities, velocities, composition, decomposition? This light or discovery “is physical in its nature, and reflex in its action,” but is *not* figurative. Now the literal meaning of *reflection*, (the one recognized in the excito-motory system) is thus given: “Reflection, the return or progressive motion of a moving *body*, occasioned by some obstacle which prevented it from pursuing its former direction.”‡ Now this spinal luminosity, being “as definite as light,” like optics, ought not to be incomprehensible to the Royal Society, nor to any other sane society. If there be any truth in Dr. Hall’s discovery, it is of such a nature that every man of education can attest it—can depose to its reality before “a court medical,” civil or military—not being the result of prolonged and deep mathematical calculation, such as the *Méchanique Céleste* presents—not such as was required in the case of Le Verrier’s late discovery. If there is really any thing “as definite as light,” which goes *to* or returns *from* the spinal marrow of a frog, it is a simple *fact*, which, whether it have any connection with Dr. Hall’s doctrines

lates the most complex and complete organ of the animal body, would the Light create or restore the same, that is, the eye? This problem might perhaps be solved in a few years, by the removal of some of these animals to the light.

* Wks. ii, 89. Lond. 1843. † Anat. ii, 221. Am. Ed. 1834.

‡ Ency. Brit. xix, 87.

or not, can be proved as easily as the movements of a ship or a locomotive,—and to make a mystery of the *reality* of the *act itself*, is an insult to the common sense of mankind. It is in vain for Dr. Hall to write of “the *mysterious messenger*;—his *message* may be mysterious, but his arrivals and departures, are *facts* susceptible of *proof*. Dr. Hall’s discovery, says the *Lancet*, “*is physical*.” Now which physical fact has he proclaimed, the existence of which “*no one*,” but himself is competent to recognize *as a fact*, leaving the *explanation* out of view? Is the loss of “*resiliency, contractility, or of shape* in the muscles” of a frog, as the *immediate* consequence of the destruction of the spinal cord, *such a fact*, as no one can perceive but himself? If his excito-motory-system be as clear and as “*definite as ordinary light*,” the laws of which constitute the most certain of all the sciences, why can no one comprehend it?

Was there ever before a discovery which, having been completed, systematized, epitomized in the form of tables, maps, and axioms, and published, no one but the discoverer could comprehend. Columbus, Harvey, Galvani, Jenner, Franklin,—all made discoveries;—Drs. Jackson and Morton, of Boston, discovered the new uses of ether in suspending the painful sensations hitherto incidental to surgical and some other operations, but, as in all other *true* discoveries, intelligent cotemporaries possessed themselves not only with the whole discovery, but confirmed, extended and perfected the same—an easy achievement, after genius has made known the true path to knowledge. In this reflex discovery alone, the contrary rule holds good. No one can understand or apply it. This failure is charged to envy, jealousy, and malice!—The *Lancet* says, “There can be no doubt, whatever, that Dr. Marshall Hall is half a century in advance of his cotemporaries.” A popular English Author says, “woe to the man who precedes his age; awful is the duel between Man and the Age in which he lives.”

The reflex school reproaches England with being behind other countries in adopting this discovery. If this be so, it is one among many proofs, that Englishmen are very much prejudiced in favor of common sense or mother-wit. From Shakspeare to Scott, and from Bacon to Brougham, this it is which constitutes the charm of their literature.—The following enumeration, by the *Lancet*, gives ten true and two doubtful disciples, as “*early advocates*” of the discovery, namely, Muller, Flourens, Sharpey, Smith, Barlow, Simpson, Grainger, Clark, Van Deen, Budd,—with two later converts, of whom it is said,—“it would be *well* for Dr. Carpenter and Mr. Newport, if they could wipe out their *former opposition* by their *later conversions*.”

Never having seen the newly discovered agent of the excito-motory-system, “*physical in its nature*,” I cannot say that it is, or is not identical with, or analogous to, light, but, I presume it is only the *Fata Morgana*, or that sort of light described in *Hudibras* :

“Whate’er men speak by this New Light,
Still they are sure to be i’t’h’ right.
’Tis a dark-lantern of the spirit,
Which none can see, but those who bear it:
An ignis fatuus, that bewitches,
And leads men into pools and ditches.”

Sternutation or sneezing is, evidently, a most important branch of reflex-science. It is a *dernier resort*, especially with the *élite* of that school; the sneezing influence is their epidemic argument. To sneeze is a great matter; its import is stupendous. But this is nothing new. One of the earliest and most universal customs of mankind was that of praying to the Deity for the safe deliverance of, and a benediction upon, every one who happened to sneeze; and, this too, by people, who, perhaps, never prayed upon any other occasion.

Homer considered *sneezing* as belonging to *Astrology* :

* * * "Telemachus then *sneezed* aloud,
* * His nostril echoed through the crowd,
The smiling queen the happy *omen* blessed."

Puck, and other fairies, in the mid-summer night's Dream, regard it as belonging to *comedy*—

"And waxen in their mirth, and *sneeze* and swear."

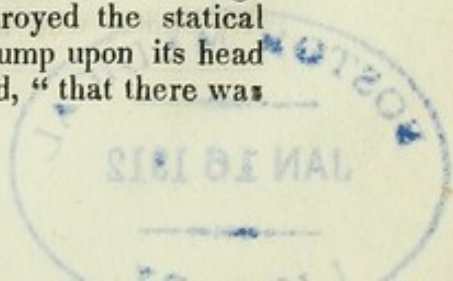
The Miltonian explanation is a *physiological* or rather a *sanitary* one :

"Harmless, if not wholesome as a sneeze."

But the reflex school regards sneezing as the dispeller of all doubts. Sneeze and believe. In order to know the eternal reasons, the hidden mysteries, the inscrutable secrets of nature, it is only necessary to sneeze. A learned Professor and a worthy citizen of New Orleans, does me the honor to say—"Surely, our author, during the course of his life, has taken a pinch of snuff, and had a good sneeze therefrom." Most true, but whether this good sneeze was a reflex, a direct, or a rectilinear operation I neither affirm nor deny positively, not knowing. It is, however, a circular argument, to affirm that the sneeze itself is a competent witness of its *own modus operandi*, or the very thing in dispute. Is it not surprising, that, as this sort of evidence always existed, the discovery was not made long ago? The number of sneezes must have been immense before Dr. Hall's era. While writing this page, I was called to aid at the *début* of an infant, which during the first ten minutes of its extra-uterine life, performed the three principal reflex acts almost simultaneously, and with prodigious force; it cried, coughed and sneezed, but I could not discern any *physical* agent marching to or from the true spinal cord, in an arched manner, "as definite as the ordinary ray."

All nations, and all genders, ought now, since the discovery has, at last, been made, to be able to testify as to the reflex nature of sneezing, &c.

For my own part, I am a *Nosarian*, as a *noseless* man could not sneeze, though "the respiratory arcs" might be in the best possible condition. In the life and opinions of Tristram Shandy, is an excellent account of a long nosed stranger, whose arrival at Strasburg created an excitement and controversy very like the present one. The disputes of the vulgar, though intense, were not more so than those of the faculty. The doctors could not admit that the stranger's nose could be as large as was represented, because, it "would have destroyed the statical balance of the *fœtus in utero*, and have thrown it plump upon its head nine months before the time." Another party argued, "that there was

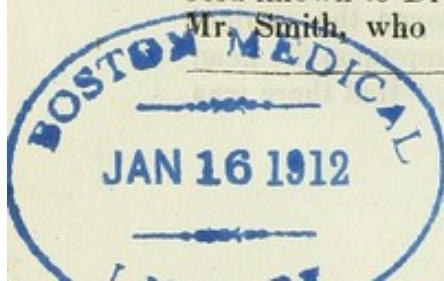


no cause in nature, why the nose might not grow to the size of the man himself." This was answered, by showing, that there could not be nutrition for both;—"mortification would ensue, the nose would fall off from the man, or the man inevitably fall off from his nose; that there was a just and geometrical arrangement and proportion of the human frame to its several destinations, offices and functions." "The logicians began and ended with the word *Nose*; and had it not been for a *petitio principii*, which one of the ablest of them ran his head against in the beginning of the combat, the whole controversy had been settled at once. A nose, argued the logician, cannot bleed without blood,"—[and, is necessary to a "good sneeze."] "God's power is infinite, cried the *Nosarians*; he can do any thing. He can do nothing replied the *Anti-nosarians*, which implies contradictions." One maintained that a nose might be as big as the steeple of Strasburg. This was answered, by showing that a middle-sized man could not wear a nose 575 feet long; but no one argued that the spinal marrow was the exclusive seat of "a good sneeze," nor, that the nose itself was a mere superfluity in that operation.

As to pathological sneezing, I will help the reflex school to a case, which is, for their views, the most favorable one that I know,—though by no means damaging to mine. A worthy printer, a patient of mine, had frequently suffered from sudden and prolonged paroxysms of sneezing, which sometimes seemed to endanger his life, and which alternated with hæmorrhoidal attacks. The premonitory symptoms were fulness, stuffing, and engorgement of the nasal passages. How the *eccentric* morbid reflex action "of the respiratory arcs," and of the anal "arcs" mutually compensated each other, acting at remote points of the "true" spinal marrow, leaving all the intervening "arcs" unaffected, while "the mysterious messengers" were running up and down "by two lines," most perpendicularly, is *not* quite so "definite as the action of the ordinary ray." Besides, it must be borne in mind, that the *modus operandi* of the sternutation is, as already mentioned, the precise *question in dispute*, in which the sneeze itself cannot be a competent witness. When the credibility of the witness is questioned, do we take *his* testimony in order to decide whether he ought to be believed? Is a sneeze in the United States bound under the constitution to criminate itself? By which of the five senses is the physical matter, with the inward and outward course of the sneeze traced, that is clearly seen, going first from the nose to the spinal cord, &c., then back, before the sneezing explosion can take place?

The reflexians take for granted—for proof they give none—that the whole science of obstetrics is but an embodiment of their system. "Dr. Marshall Hall, says the *Lancet*, has himself declared that it will one day form the very basis of scientific midwifery—constitute an entire department of the medical art—the key—the corner-stone,* etc.; now, all this, "physical in its nature, reflex in its action," is done, not by the common material spinal cord known to anatomists, but by a *true* spinal cord known to Dr. Hall alone. A lecturer on Midwifery, in London, Mr. Smith, who has, according to Dr. Hall, made out of this reflex

* *Lancet*, Nov., 1846.



discovery a department peculiarly to his own, testifies in effect, that the whole science of obstetrics comports or adopts itself precisely to Dr. Hall's theory, and is, therefore, the reflex Ideal, Actualized—an incarnation of "the imponderable, the physical, the dynamical." Mr. Smith deposes as follows: "The act of parturition never had been and never could be studied *properly* as a motor function, until the *discovery of the spinal marrow* by Dr. Marshall Hall! The spinal marrow is the central presiding organ. All the chief physiological uterine motor actions are reflex in their nature."* What is the proof? Nothing but a few obscure, meaningless experiments upon frogs, turtles, and salamanders, not even in the act of parturition, but in the last *agony—in extremis* and under the stimulus of thunder, &c. Call you this the *discovery* of the spinal cord?

Without pretending to know anything of parturition in the latitude of London, I can affirm, after having witnessed many acts of this nature in Virginia, and in New Orleans, that if anything reflex—any "mysterious messenger" ever travels to or from the *true* spinal cord, "as definite in its action as the ordinary ray," I never could see it. This phenomenon must be peculiar to London. It is believed that no one in America will testify to this fact—"physical in its nature"—before any court medical or obstetrical. There is, however, a very inexact method of testifying to '*physical facts*,' suggested by Mephistopheles to Faust, who hesitated to bear testimony as to the reported death of Martha's husband: "Is it the first time in your life that you have borne false testimony? Have you not confidently given definitions of God, of the world, and of whatever moves it? And looking fairly at the nature of things, did you—you must confess you did not—did you know as much of these matters as of Mr. Schwerdtlein's death?"

Assertions are easily made, but when unproved and improbable, they ought not to have much weight. The spinal marrow, not less than the brain, heart, and so forth, is doubtlessly necessary to natural labor, though both reason and experience teach that the expulsive power in that great hollow muscle, the uterus, is not *reflex*, but the *direct inherent* act of its muscular tissue and function, other organs contributing only in a secondary manner. The uterus, like other muscles may act after death: in Moreau's late work on Midwifery, he relates the case of a parturient woman, whom he was called to see;—but not arriving until after her death, he proceeded to turn and deliver. The uterus *contracted perfectly*, and expelled the placenta completely. I have observed, not only an apparent resistance to the introduction of the thermometer into the rectum, but a partial expulsion of that instrument, not to mention defecations in cadavera, under circumstances not admitting of a very satisfactory explanation from the expulsive power of post-mortem gases and the like, though, it must be confessed, that this kind of proof is equivocal.

Early in the last century, when midwives were more ignorant than they are now, they attended only to the placenta, which, immediately after accouchement, was forcibly pulled away, destroying thereby many lives; Ruysch directed that the practice should be discontinued, declar-

* Lancet, May, 1846.

ing that he had discovered in the fundus of the uterus an orbicular muscle, (*detrusor placentæ*), whose special business it is to expel the placenta,* drawing the surface of the uterus by a gliding motion from the corresponding surface of the placenta, thus separating it and casting it off;” the existence, as well as the function of this muscle, Bell admits,† because Ruysch saw it, adding, that he had “nearly an absolute reliance on the observations of that author. The editor of Cuvier’s work,‡ denies the existence of any such muscle, and considers it as altogether incomprehensible that nature should place a muscle in an organ, which is *itself* only a muscle.

The reflex school does not seem altogether exact in their neurography, in claiming the uterus for the *true* spinal marrow exclusively, for anatomically speaking, this viscus is vastly dependent on the sympathetic system for its nerves. The operation for the removal of *placentæ* retained by hour-glass contraction which I have several times performed without pain or ill consequences, illustrates Bichat’s notion of the little sensibility of that system of nerves, with which the great organs of the centre are connected.§

There can be no doubt that the expulsive power in parturition, is essentially a muscular effort. The nervous system, including of course sensation, its great function, usually dies in advance of the muscular—an opinion, which, independent of experiments, it would not be difficult to support. It may be sufficient to say, that many writers could be quoted, proving, as above stated, that after the death of the mother, the uterine action has continued, resulting in post-mortem births—the children being usually dead. It is out of the question to regard such deliveries as the result of post-mortem gases, or of any merely mechanical force.

Reflexism affects an admiration for Numerism, though, as yet, nothing has appeared to justify this Arithmetical pretension,—no exact histories, no numerical analyses. Dr. Hall dedicated his Lectures on the Nervous System to the father of numerism, M. Louis—a book of 2,000 or 3,000 sentences, with about one thousand divisions, duly marked with numerals, but not a single case or experiment in a tolerably complete form to compensate for a great many assumptions. The British and Foreign Review,|| justly remarks, that Dr. Hall’s researches “are in absolute *contrast* to M. Louis.” “There is not, we repeat, the slightest attempt at a physiological or numerical consideration” etc.—Dr. Hall must, therefore, admire Numerism by way of contrast to Reflexism. Coleridge must have had a glimpse of this kind of admiration, when he asserted of connubial bliss, that ‘a *contrast* of character

* Hist. Sci. Nat. ii, 405. † Anat. and Phys. ‡ Hist. Sci. Nat. ii, 515.

§ It is the *cervex uteri*, not the *fundus* which possesses acute sensibility, if I may judge from obstetrical experience. In asserting that no ill consequences, or even pain has resulted from this operation, I by no means dissent from Dr. Fenner’s views of the management of retained *placentæ*, set forth in the last number of this Journal—a few lucky cases do not form a rule. My first case of hour-glass retention was in the country. I was forced to act in order to escape, if not a *lynching*, at least the condemnation of a dozen of ladies. After passing the *os tinæ*, no sensibility was experienced.

|| January, 1847.

is essential to happiness." M. Louis' facts relate to man ;—Dr. Hall's to reptiles. M. Louis gives appropriate names to his books, as Yellow Fever of Gibraltar, Phthisis, Typhoid ; Dr. Hall calls his experiments on the most inferior animals, Human Physiology,—The Nervous System,—The True Spinal System—Excito-motory System,—Pathology and Therapeutics of the Nervous System,—Scientific Obstetrics! M. Louis gives facts, physical changes, an account of all the organs, without bias or selection ; Dr. Hall gives opinions, confines himself to *one* organ chiefly—to imaginary reflex functions, arcs, lines, curves. M. Louis generalizes his facts,—Dr. Hall his opinions. The former gives analyses of his histories,—the latter of his hypotheses. Louis builds upon arithmetical averages ; Hall, upon reflex abstractions. Louis copies from nature,—Hall from Hall. Louis can be understood by others—Hall by Hall only. Louis philosophises upon the thing,—Hall on the word Reflex. Louis' studies being material, lie within the realms of sense—Hall abhors these as pestilential entities, "rendering the mind inept" in comprehending the reflex discovery. The former numerizes, reasons, and makes a free will-offering from his scientific treasury, without attempting to coerce his *confrères* ; the latter dogmatizes, anathematizes, and would, the law permitting, "crush as vipers"* all dissenters who believe not in him, or rely on any other reflex name but his.

As illustrative of the *morale*, as well as of the method of argumentation in the reflex school, I subjoin, with reluctance, the whole of Dr. Hall's famous communication† in the New York Journal of Medicine for January, 1847, enclosing the words of the editor in brackets. I do this, because the following, as well as some preceding remarks, cannot be otherwise intelligible, and, because this is an average specimen of the means resorted to in order to intimidate oppositionists.

Hitherto the reflex thunder has been directed against* others, rather than myself. This is remarkable, because the denunciation of European oppositionists was based, not on their dissent to the reflex system, which,

* Dr. Hall gives an anonymous letter from Paris, in the *Lancet*, from "the first physician of our day"(?) averring that "the reflex actions of the spinal marrow are regarded in the Academy of Medicine as an established fact"—whereupon Dr. Hall breaks forth against Her Majesty's United Kingdom, thus : "In the midst of the attempts at detraction here, it is a relief, &c. The viper detraction is only just crushed ; being cold blooded, it has been very tenacious of life." (*July*, No. '47.)

† [MARSHALL HALL AND DR. DOWLER.—We have received a communication from the able author of the "reflex doctrine," complaining of the language employed by our correspondent, Dr. Dowler, in the May number of our Journal, and especially of the imputation of "Materialism," imputed to him by Dr. D. This charge is denounced as] "cowardice and calumny, refuted by anticipation, by § 9, &c. &c. &c., of my work on the Diseases and Derangements of the Nervous System. The rest is as little founded in truth, moral or scientific. Many have been the attacks on the poor reflex doctrine, but none to compare with this last, and not one with *one* fact, or sound argument against it, Dr. Dowler's inclusive. Many and great are the efforts being now made here to sustain the *Status* of our profession. I am sorry that you should have sanctioned by your name, in any way, what must be certainly considered an attempt in a contrary direction."

indeed, they generally admitted, but on their denial of Dr. Hall's assumed claim as the discoverer thereof. My experiments, taking the same point of departure with Dr. Hall's, show that his fundamental doctrine cannot be true; it was reasonable, therefore, to suppose that I should have incurred the maximum of displeasure—I say reasonable, because in the logic of this school, the most conscientious men, who cannot believe in the reflex dogma, are denounced as felons, as the numerous readers of that able periodical, the *Lancet*, must have observed; the Royal Society, for example, is represented as a band of conspirators, allied together for the criminal purpose of preventing the extension of “the second great discovery—a discovery which is destined to revolutionize the whole science of medicine,” and to bring in that more than millennial glory, which, the most imaginative Æsculapian, never yet dared to predict, since “man's first disobedience which brought death into our world with all our woe.”

What does Dr. Hall mean by “the *STATUS of the Profession*, to sustain which many and great efforts are now being made?” Does he mean that dynamical spiritualism, that moral force and beauty, known to erudite Heathens, as *honestum*,—Τὸ καλὸν? Στάσις, *status*, *state*, *standing*; the moral sublime—the eternal fraternization of all faithful Æsculapians,—is this the interpretation? Is this the *Status*?

The very best rule that can be adopted in doubtful cases, in verbal and doctrinal criticism, is after giving the literal meaning, to give examples showing how the writer applies the rule himself. The *Status*, then, by this rule signifies in its practical, that is its *reflex* sense, that Dr. Hall and his adherents are not amenable to the law of libel,—but have a right, or a *carte blanche*, to call about nine tenths of the medical profession, that is all dissenters from the reflex doctrine, the following names—sometimes in the singular, but generally in the plural: “Laggards, obstructors of the truth, consummately mean, impudent, ignorant, physiological Dogberrys, worms of the Nile, foiled disappointment book worms, calumniators, abominable and false slanderers, wicked, foolish, malignant, bitter, envious,—like the kiss of the ancient lady, to all comers,—cowards,—unable to comprehend the reflex function,—damning serpents biting the file after the teeth are all gone—deserving to be tried before a court medical,”—not to mention other epithets without number; such epithets as bad men seldom, if ever, apply to the greatest felons, even after sentence has been pronounced against them,—yet these are the choice phrases used to designate that brilliant constellation of worthies now shining in the medical heavens. In the reflex vocabulary alone, is found such an exhibition of the *STATUS*, of the moral sublime.

“Many and great have been the efforts to sustain the *status* of the profession, here, says Dr. Hall. It may be so. But the success seems “to grow small, and by degrees beautifully less.” The word *status*, in its *reflex* meaning, is therefore but little better than that by which Goethe characterizes the French language, in his *Wilhelm Meister*: “is a language of reservations, equivocations and lies; it is a *perfidious* language. Heaven be praised! I cannot find another word to express this *perfidy* of theirs. Our poor *treulos*, and the *faithless* of the English

are innocent babes beside it." The excito-motory style was not known to Goethe.

The following propositions are, it would seem axioms with the *Lancet*, (and here the style changes :) "Dr. Hall stands alone in the modern history of real and legitimate discovery." "Of cotemporary names, who by their own egotism or the vanity or partiality of their friends have been placed in competition with our author, it is scarcely necessary to say a word. For any actual competition there never was *any chance*. Dr. Marshall Hall has always been too lynx-eyed, and too far in advance of his cotemporaries for this."* Let the reader always remember that this discovery relates to frogs and turtles, and can be as well tested by a "first course student," as by any man, howsoever learned he may be, as "it is physical in its nature,—reflex in its action"—a discovery, which if true of frogs, does not prove the reflex doctrine even among them, excepting in a special state, &c., and if it did, must be limited to the single, artificial condition of the particular vivisection, and which can no more be received into human physiology, than the other peculiar habits and functions of those animals.

Why should dissenting physicians, who cannot conscientiously receive "this as the second great discovery," be nothing but "cowards, laggards, obstructors of truth," whose very memories shall be accursed by succeeding generations? Do these propagandists remain ignorant of the fact, that medical faith is an involuntary act? If, in the language of Dr. Hall, the discovery is "as clear as the ordinary ray," disbelief is impossible. Can any one doubt the existence and action of "the ordinary ray?" If, as I contend, Dr. Hall's experiments have no more connection with his doctrine, than they have with the ebbings and flowings of the tides, are not some doubts allowable, nay, unavoidable? In offering fifty or sixty histories, not of frogs, but of *bona fide* men and women,—an humble offering, it is true—have I done Dr. Hall any personal wrong—committed a mortal sin? If my experiments nullify his on frogs for all the purposes of human physiology and pathology, am I to be blamed? Had I anything to do in forming the laws of Nature? A lover of scientific truth does not regard as a calumny, or a *caning*, an attempt to investigate the physiology of the muscles, even though the result might show the fallacy of frog-experiments, when applied to man. Is it a virtual assault and battery, to show that all that Dr. Hall can do *with* the *true* spinal marrow, aided by *electricity*, I can do ten times better *without*? Is it a crime to show the traveller that he has mistaken his way?

The great efforts made, and means used, to pass this assumed discovery upon the world for a *bona fide* one, naturally begets a suspicion that it is only a counterfeit: "M. Say relates a story of a woman, who for a wager stood the whole day on one of the bridges of Paris, offering

* This kind of philosophy is very common among our Indians. If the MEDICINE MAN, such as Tecumseh, the Great-Bear, Black-Hawk, or Walk-in-the-Water, consult his MEDICINE-BAG, every body must submit: "For, (in the language of the *Lancet*.) actual competition there never is *any chance*;" the medicine man is too lynxed-eyed, too far in advance of his cotemporaries for this," and his Medicine-Bag is equally potent with Dr. Hall's true spinal marrow.

to sell a five franc piece for one franc, and (naturally) not finding a purchaser."

The spinal cord, to say nothing of its equivocal physiology, is the obscurist of all organs in its pathology, and the least certain source of diagnosis, except to *Dr. Hall*, who at a late meeting of the London Medical Society,* informed that Body, that "the spinal system had become the source of all diagnosis—a gift and boon conferred on the art of knowing and curing diseases—taught the nature and value of symptoms—was our sole diagnostic;"—and then kindly added, "for the correction of a certain weak and ignorant set of persons who wrote and spoke foolishly upon the subject," that "no one knew or understood the subject, who had not seen with his own eyes *the actual experiments*"—all of which the society accepted with meekness—no dissenting voice was raised; but speech after speech was made, in favor of Hallism and nothing else. I will not call this fanaticism, nor orientalism, but *sciolism* it must be; for if *Dr. Hall's* most accredited expounders can be relied on, "there is not another person who understands, and fairly treats of the *true cord*, its discoverer excepted." The doctrine is here reiterated, namely, that *no one can know or understand* the discovery, unless he sees with his *own eyes* *Dr. Hall's* reflex experiments! All other believers, therefore, must believe *without* any evidence whatever; and still worse, *no one but the discoverer can comprehend* these experiments, even after *seeing* them! Hence all physiologists must conduct themselves like sheep. Here, a little explanation may be necessary for city doctors, who have not observed the habits of these animals. In the hilly portions of the country, where the fences are generally *reflex*, consisting of a series of salient and retiring angles, it often happens on the slope of a steep hill, that the BELL-WETHER, in jumping a fence, strikes the top rail, and thereby precipitates, perhaps twenty pannels into the plain below, especially if the fence be wet at the time. Now, although not one rail be left upon another, each sheep of the entire flock, instead of relying on his own senses, and walking quietly over the prostrate fence, will jump just as high as his Leader jumped, to the great danger of breaking his neck.

As to my charging *Dr. Hall* with Materialism, and which he bravely calls calumny and cowardice, I can only say, that it is a pure fiction of the John Doe and Richard Roe kind, serving only to give him an occasion to refer to a work of his. I have quoted *Dr. Hall* as saying that the *true spinal cord* "is the sole seat of all the emotions, passions, and appetites."† But I have not said that he was a materialist.‡ The Pantheists, materialize the Divinity whom they consider literally as the All, the Whole, the Aggregated Universe. Berkeley denied the existence of Matter altogether, maintaining that the mind with its ideas, alone, had any positive existence. Yet Pope ascribed to

"Berkeley, every virtue under Heaven,"

* *Lancet*, Aug. 1847.

† *Nervous System* 4 to. 96, 71.

‡ Whether a materialist or an immaterialist in physiology be the greater heretic, is a quiddity, worthy of the study of one

Who can "distinguish and divide
A hair 'twixt South and South-west side."

though he was an *immaterialist*. A German writer approved Diderot for saying, that the *Monades* would one day unite and form a God, if one did not already exist. I fully acquit Dr. Hall of atheism, pantheism, materialism and monadism; but, at the same time his *spinalism* is equally absurd. His *distinct anatomies*, physical dynamics, spinal arcs, mysterious agents, passions, reflections, incidences, curves, *true* spinal cord, &c., seem at times both material and immaterial. On the whole his system inclines, not to materialism, but to *immaterialism*; indeed it is declared expressly, that "all *material studies* render men's minds *inept*" to Dr. Hall's studies!

The reflex school greatly mistakes the proper method of making converts. Does Dr. Hall think that the medical public can *be coerced* into a belief of his hypothesis? Does he really adopt the logic of Hudibras?

"Some have been wounded with conceit;
And died of mere opinion straight;
Others, though wounded sore in reason,
Felt no contusion, nor descretion.

* * * * *

But since no reason can confute ye,
I'll try to force you to your duty,
For so it is, howe'er you mince it,
As ere we part I shall evince it,
And curry (if you stand out) whether
You will or no, your stubborn leather."

The Falstaffian philosophy, of giving no man a "reason on *compulsion*" is more rational. There is, it seems, but one method of escaping the wrath, and of securing the good will of these fiery reflexians, who swear by Dr. Hall's theory;—it thus explained by Dean Swift: "It is an easy and short way to obtain the reputation of a wise and reasonable man, wherever any one tells you his opinion, to agree with him."

The whole of Dr. Hall's argument concerning the "*Status* of the profession," when interpreted according to its reflex meaning, is this: to proclaim Dr. Hall's few frog and turtle experiments as constituting that great discovery "destined to revolutionize medical science," is to "*sustain the status* of the profession"—to offer an host of experiments upon men and women which completely nullify his discovery, "is certainly an attempt in a *contrary direction*." With the present paper, I will have published about sixty individual histories of contractility, not to mention a vast number not yet published—the individual acts of contraction, of these sixty cadavera, amount by estimation to one thousand;—amputation, the division of every discernible nerve, the destruction of the spinal marrow and evisceration, were performed in a sufficient number of these to establish the law to which there is no exception, and which overthrows the fundamental doctrine of Hall, namely, that the spinal cord has no influence whatever upon the contractility of human bodies recently dead. Now if these cases had been given, however falsely, as so many proofs of Dr. Hall's discovery, nothing would have been heard of this "*status*," &c.

In a word, I say with all the fearlessness of truth, that my experiments disprove, as far as the human body is concerned, the reputed discoveries of Bell, Hall, and others, who ascribe to the anterior roots or to

the *true* cord, or to the sympathetic, or to any other portion of nervous matter, the *force* necessary to muscular contraction. My experiments are direct—the force I apply, on an extended arm, is towards the centre of the earth—the effect produced is in the opposite direction—is contrary to every other known force or motion, and is that appropriate to the function of any given muscle;—all is clear, definite, unequivocal, and unlike that obscure *mélange* of frogs, and convulsions, and electricity, which constitute “the second great discovery.”

The *Lancet* charges Bell with “the singular and deplorable weakness of not mentioning, in all his works, the name of Marshall Hall.” Is there any weakness in this? The veteran vivisector had labored long in the field of experiment, without obtaining definite and positive results illustrative of human physiology and pathology;—was he bound, therefore, to rely on inferior evidence, and to believe the “physical nature” of reflex impossibilities? Having failed in the experiments necessary to establish his own “NERVOUS CIRCLE,” was he bound to replace it with “arcs, lines, distinct anatomies, the mathematics of the nervous system, Euclid, definite as the ordinary ray”—the mere mystifications, physiological travesties, kaleidoscopic views and dissolvent scenes of his own labors, baptized by the attractive names of Excitomotor-system—Reflex system—a system which localizes in the *true* spinal cord, with an host of healthy, morbid, curative, obsterical agents, entities, actions, and functions, including “the emotions, appetites, and passions,” and which must be a perfect pandemonium—

“Black spirits and white,
Red spirits and grey,
Mingle, mingle, mingle,
Ye that mingle may.”

As Harvey's great discovery nearly ruined his private practice, owing to the opposition which it brought from his professional brethren, some condemning it as an innovation, others maintaining that it was known before,—so Dr. Hall's potent abstraction seems to have had a similar effect. The *Lancet* says, “we have heard Dr. Marshall Hall say, that if he had been devoted to physiology before he had established himself in practice, he should never have succeeded at all. Sir Charles Bell had the same story to tell; he has left it on record, that after every step in his discovery he was obliged to work harder than ever, to preserve his reputation as a practitioner.” “This discovery met a better fate” [than Dr. H's.;] he had to complain not of black balling, but that his papers appeared without exciting attention; but his time came, and suddenly, as he says, after reading a paper no better than the rest, a cumulative reputation, worthy of all his labors, burst suddenly upon him, and he stood confessed the head of anatomy and physiology at that time. Knighthood followed.”† And it may be added, that VICTORIA I. pays his widow a pension for this same *discovery*.

* This word is not too strong. Had I space, I could show, that, until the laws of nature be changed, much in reflex experiment and deduction is physically impossible, being not a discovery, but a *revolution* in the constitution of nature.

† Dr. Copeland has lately remarked, that “Dr. Hall's doctrines have been more advanced by his supporters than by himself, as the opinions admitted by

It is pretty evident that the "second great discovery" is looking up for "the honors of knighthood." Hence, the intolerance towards all who oppose the excito-motory system.

Post-mortem contractility presents an important point of departure—a dynamical type for studying the physiology of motion, serving at once to ascertain and fix the uses of each muscle, and to develop the leading but peculiar force inherent in all the contractile tissues. It may seem contradictory to study a living function or principle, in a dead body.—Did Goethe intend a satire on the physiologist where he says in *Faust*—"He who wishes to know and describe anything *living*, seeks first to drive the *spirit out of it*; he has then the parts *in his hands*; only, unluckily, *the spiritual bond is wanting*?" In the present instance, however, the general or popular death, leaving as it often does the muscular force alive, aids this investigation, in several respects, chiefly by insulating this force from an host of vital and modifying complications derived from the mind, sensation, circulation, respiration, &c.; thus preparing the inquirer to rise to higher and more complex laws in physiology. The study of the muscular force will probably end in, or serve as the prelude to, a great dynamical discovery in the organic, like that of gravitation in the inorganic world. Professor Whewell says, "many anatomical truths have been discovered, but no genuine physiological principle. All the trains of physiological research have begun in exact examination of organization and function, and have ended in wide conjectures and arbitrary hypotheses. Hitherto we have had to tell of the *failures* of physiological speculation."*

It has been already said, that the flexions of the forearm afford the best myological type for physiological post-mortem dynamics: Thus the biceps and brachialis being inserted into the most unfavorable ends of two levers, must act to the greatest disadvantage,—that is nearly all the forearm, not to mention the hand with weights in the palm, lies beyond the point where the force is applied; in other words, the resistance is remote from the force. This resistance is aided by friction at the fixed end or elbow, by incipient rigidity in some, and by the antagonistic muscular force and physical elasticity or resiliency of the opposing muscles in all cases. The small angle at which those muscles are inserted, diminishes, to a great extent, their force, percussion probably does not excite all portions of the muscle at once; besides it is presumed that great obliquity in the insertion is a bar to the equal and the simultaneous action of all the fibres, particularly in such a muscle as the deltoid. Now if we admit the dynamical principle that as much force is lost on the fixed, as on the moving end of the fore-arm, it follows, that, if the fore-arm and a body placed in the palm shall weigh ten pounds, the force exerted to carry these to the perpendicular must be equal to about two hundred pounds placed at the point of insertion. The physi-

him were either obscure as if he had himself seen them only through a haze, or they were successively inconsistent with, or different from, those previously published. May they no longer be tortured by their overfond parent, in hopes of bestowing upon them that decent form which they are incapable of receiving." (Lancet, 1846.)

* Hist. Ind. Sci. iii. 431-2.

ological antagonism of the muscles, is really no hypothesis: I have known it more than once to extend the arm spontaneously, immediately after the subsidence of the flexor-paroxysm of contraction. The few cadavera on which I have experimented the present year, have not presented this most curious phenomenon, and I find my notes, as to this particular, very indefinite in former years;—whether the extension retrograded by the same route in which the flexion advanced—whether any massive knot took place in the triceps, with other questions, require further elucidation.

It may be doubted whether these and similar questions, will be satisfactorily solved by electrical experiments upon animals, now strangely named *Electro-Physiology*—a study to which the distinguished Professor Matteucci, of the University of Pisa, has given much attention. In a recent communication to the French Academy, he terms the eight propositions which comprehend the whole of his speculations, nothing more than “*some hypothetical ideas*,” and which I reduce to a single sentence, namely: *There is a NERVOUS FLUID existing in, and generated by the MUSCLES, whence it is diffused TO THE NERVES from their extremities to the brain, where it is subjected to the will.* Here all is reversed, neurography, myography, physiology,—the origin, direction, and distribution of the nervous force. Now I propose, not as “a hypothetical idea,” but as an indubitable verity which I have fully established, to reject all circumlocutions, and to name this force, what it really is, a peculiar and inherent property of the muscular system, which, in the voluntary muscles, during life is subject to the will, which often remains for hours after death,—which may be called into appropriate action by percussion, and which, if I may judge from the published statements of electro-physiologists, cannot be proved in a satisfactory or natural manner by exciting, or combining it with an electrical force. What a perversion of language, what an inversion of logic, to call the nervous fluid a muscular product, or to call the muscular force a nervous fluid!

This is infinitely more than I could ask in behalf of the muscles; but, without admitting that the electro-physiological method is at all conclusive, I must confess that this theory is still more simple and much nearer the truth, than the usual one—namely, a hypothetical fluid which does nothing but hand over its power to the nerve,—which latter can do nothing only to hand over *its* power to the muscle, by afferent and efferent routes, &c.

The following supplemental observations on post-mortem contractility, were made with the utmost care, amid the excitements incidental to an epidemic, which, for many weeks has every day struck down as many victims as might be expected from the daily shock of hostile armies.*—

* This season, meteorologically speaking, is healthy—historically, mortal; ceaseless breezes, loaded with ceaseless sighs; a balmy temperature, with fiery plagues; refreshing showers, with scalding tears; starry nights, with cheerless lights flickering in the chambers of the dead. The morning breaks brightly; the afternoon is overcast with thunder-bearing clouds, which evening rolls away in banky masses, fringed with red, shimmering in the setting sun; while, funeral marches blacken the streets—while the dead carts, loaded with victims, coffin rumbling upon coffin, pass on, without a single mourner. Even the strong mind of Johnson, quailed at the idea of dying unwept. Philanthropy

No dissection was deemed necessary. I take for granted, that in no case does the destruction of the brain, the spinal cord,* the great sympathetic, the nerves, viscera, produce any diminution of the muscular force. Having arrived at this result by direct experiment, nothing remains but to investigate the physiological dynamics of the muscular system. This I do not propose to engage in at present, but simply to offer a few new experiments, with some remarks, not having time to copy old ones, much less to entertain speculative views upon the subject. It may be proper to state that the cadavera experimented on, were the victims of the now prevailing epidemic which has already more than decimated the unacclimated portion of the population of New Orleans.

I.—August 8th, 1847. J. F., resident 15 days—sick 9 days—dead 30 minutes—experiments lasted for one and a half hours after death. The mercury soon reached 101° in the axilla, and remained stationary. During this period about twenty flexions of the forearm took place from percussing the biceps, after having placed the limb at a right angle with the cadaver; the fingers rested over the centre of the chest or abdomen. The contractility after having been apparently exhausted, was, after some time, reinforced spontaneously without frictions. A blow upon the middle of the pectoralis major, caused a rapid, but slight jerk of the middle portion of the shoulder joint downward and forward—a rare phenomenon; for although this muscle is very contractile, the weight of the cadaver makes the shoulder a fixed point. The muscular *nisus*† or effort is generally strong, but for motory purposes unavailing. If friction, pressure upon the upper end of the humerus, and the weight of the forearm could be obviated, the complex action of this muscle could readily be demonstrated. On semi-flexing the thigh, so as to bring the knee nearly to the vertical, the leg hanging down, clear of the floor, and percussing the rectus femoris, the foot and leg were instantaneously carried nearly one fourth of the distance towards the vertical, but returned as quickly by its gravity. The cadaver was now turned over on the face;—the flexors of the leg were percussed—a strong *nisus*, but no flexion took place.

and Science, busied “in the labors of love,” are mute as to the *essential cause* of the epidemic. No changes of the weather can be designated as satisfactory causes of the prevailing mortality.

The highest temperature at sunrise in the air, was for July, 78° , for August, 79° —in my office $82\frac{1}{2}^{\circ}$ and $83\frac{1}{2}^{\circ}$; in the ground, in a grass lot, 6 inches deep, at 3 P. M. 83° and 82° ;—the river at sunrise, $85\frac{3}{4}^{\circ}$, and 86° ; at 3 P. M. $85\frac{3}{4}$ and 86° . The River in 1845 and 1846, reached in August, $\frac{3}{4}^{\circ}$ higher than in 1847. The diurnal range of the river is hardly appreciable—generally a fraction of a degree. There occurred in the present year the most extraordinary change of temperature that I have ever noticed in the river: on the 9th of August, at sun rise, the river gave 86° —the Levee 71° —the street 79° ; on the 13th the river was 83° —the 18th and 22d, $83\frac{1}{2}^{\circ}$ —the 29th 85° ; Sept. 1st, $84\frac{1}{2}^{\circ}$.

* It might be well for the reflex school who spinalize almost every function, to call to mind that competent authorities might be cited, showing that children have been born with neither brain nor spinal cord. Can they point out a case in which the entire Ganglionic system of nerves was wanting?

† It is necessary to use some such term to prevent confusion, that is, to distinguish the effort, from its accomplishment. The effort may be intense, yet many causes, chiefly rigidity, may prevent motion.

II.—At the same time, J. W., born in Boston, aged 34, resident 9 months, dead two hours, had rigidity of the neck and abdominal muscles, with a temperature for half an hour of $102\frac{1}{2}^{\circ}$ in the axilla, and $105\frac{1}{2}^{\circ}$ in the rectum, while the muscular *nismus* in the pectoralis and biceps was strong, producing massive knots, but no functional motion.

III.—On the same day—J. E., a German, aged 30, resident 18 months—died at 4 P. M. The experiments began in half an hour, and lasted an hour and three quarters. *Caloricity*.—Axilla, 5 minutes 102° —5 m. 103° —10 m. 103° ; rectum, 13 m. $104\frac{1}{2}^{\circ}$; axilla, 5 m. $102\frac{1}{2}^{\circ}$ —5 m. 102° ; rectum, 5 m. 104° . *Capillary Circulation*.*—The veins of the arm were collapsed. A ligature was applied as in ordinary blood letting, though somewhat tighter—the veins became distended as in the living body, though the position of the arm was varied by elevating and depressing it, and finally, by turning the cadaver over; at all elevations, the distention continued with but little variation, though it was greatly augmented by moving the muscles of the forearm, as in ordinary blood-letting. The arm without ligation presented no venous distention. *Contractility*.—The arm was extended; the biceps was percussed with the ulnar edge of my hand—the arm arose to the perpendicular; the handle of the hatchet was used at intervals upon the same spot, and with a similar or rather increased effect, three or four times, after which the muscles appeared to be completely exhausted. These blows covered about one inch of the length of the flexors. I then took a piece of plank, wide enough to extend about one inch on each side of the exhausted part of the muscle;—each blow for a considerable period caused much more perfect flexions, the hand being always quickly placed on the breast; finding at length that the force was declining, I took a wider piece of plank, covering the whole length of the biceps,—upon using which, the contractions were more powerful than ever, until about twenty flexions took place. Exhaustion now quickly ensued. At $5\frac{3}{4}$ P. M., the neck became rigid. A blow caused strong and prolonged *nismus*, with a large dense knot, lasting nearly a minute before relaxation occurred, but without changing the position of the limb. The thigh, as in case I, was semi-flexed;—a blow over the rectus femoris, produced similar effects.

IV.—August 20, 3 P. M.; air of the house 88° . N. B., born in France, aged 45, resident 18 months—dead one hour. *Cadaveric hyperæmia*,† well marked—on turning the right or left cheek towards

* See an allusion to this subject near the close of this paper.

† This was comparatively a slight case of *post-mortem hyperæmia*, scarcely transcending the average, and falling short of many. This change often begins, even before death and during the agony in dependent parts. If the cadaver be turned on the face, in a few minutes after death, it will in many cases become so discolored as to look nearly black, especially in that portion of the tissue which was the most flushed or injected in the early stage of the disease. The vast import of this change, which in many bodies allows the blood immediately after death to run through the capillaries like a seive, flowing and re-flowing from side to side, by simple gravity, has never been appreciated in pathology nor in *morbid anatomy*. A pathologist, wedded to the gastric theory of fever, cannot see without a profound sensation, the faintest discoloration of the mucous membrane, even one or two days after death, while

the floor a dark red congestion of the skin took place in the dependent parts, in from three to five minutes, and so of the limbs and body. *Caloricity*.—Axilla, 3 m. $102\frac{1}{2}^{\circ}$ —5 m. $102\frac{1}{2}^{\circ}$ —5 m. 103° —5 m. 103° ;—rectum, 5 m. $103\frac{1}{2}^{\circ}$ —2 m. $103\frac{1}{2}^{\circ}$ —30 m. axilla, $102\frac{1}{4}^{\circ}$ —10 m. $102\frac{1}{4}^{\circ}$. *Contractility*.—Flexion of the right arm was made artificially, the hand of which was made to rest on the floor, between or beyond the left ear and shoulder, the elbow having been elevated nearly over the wind-pipe, so that the arm could not return, except by overcoming the force of gravity equal to the entire forearm, not to mention the incidental friction, which the result showed to be great. A blow with a piece of plank upon the upper part of the triceps and the outer third of the deltoid, caused the extension of the arm, though considerably short of a right angle with the body; the forearm was dragged obliquely over the breast, flexed upon the arm, the semi-flexed fingers raking the chest; the hand came to rest on the floor near the axilla. The experiment was repeated several times with a similar result. The motion was probably due chiefly to the outer portion of the deltoid. The flexors, (perhaps always stronger than the extensors in the dead body,) did not act with much force;—a blow with the hand raised the forearm about ten degrees above the floor—with a plank ninety,—but the elevation became less and less from repetition. Three hours after death, a *nisus* only remained.

V.—August 21. A. J., born in England, aged 45, resident 9 months—dead three quarters of an hour;—observations ended the 3d hour after death. *Caloricity*.—Axilla 5 m. 104° —5 m. $104\frac{1}{2}^{\circ}$ —5 m. $104\frac{3}{4}^{\circ}$ —3 m. 105° —2 m. nearly 105° ; rectum 5 m. $102\frac{1}{2}^{\circ}$ —5 m. $102\frac{1}{2}^{\circ}$; axilla 10 m. $104\frac{1}{2}^{\circ}$ —5 m. $104\frac{1}{4}^{\circ}$ —2 m. 104° . *Capillary circulation*, the same as in III. *Contractility*.—A blow with the hand caused a complete, but slow flexion, occupying a number of seconds;—the hand was carried to the outer end of the collar bone, where it was allowed to remain five minutes, when the limb was again extended. A bar of iron about six inches long, weighing exactly twenty-one ounces, was tied in the palm, extending to the tips of the fingers—percussion was followed by a slow, but uniform motion—the arm arose to the perpendicular—the hand with the weight descended gently to the middle of the breast bone. The force was so constant, the motion throughout its semicircular path so equable, that it was comparatively easy to estimate its velocity. It might seem incredible, that the hand, the arm, and the iron, should not be greatly accelerated by the force of gravity, after passing the vertical; it might be expected that they would, from the two forces coinciding, fall heavily and with increased velocity upon the chest, and not gently, as was the case:—Explanation is scarcely comprehended within the scope of this paper; yet, some of the phenomena in this case call for one. The following is offered as probable, if not demonstrative. The distribution of the muscular force tends to antagonize mus-

his subject, if turned on the face for a short time, say from two to ten minutes, will, at a few paces distant, look nearly like a negro—a discoloration which is despised, because it is in the skin! In morbid anatomy, as in practice, an exclusive theory ends in sciolism. The subject here alluded to requires a distinct essay, being a pathological and an anatomical as well as a post-mortem and a physical alteration.

cles whose functions are opposite, giving a tone or passive contraction, so as to form an equilibrium so long as this power is latent and equal. Percussion destroys this equilibrium, this latency, causing an accumulation of free force like free caloric or positive electricity. This excitation induces contraction,—flexion, for example. In the mean time, the latent muscular force as well as the elasticity of the antagonistic muscles, the extensors, resist this excited force, more especially after the hand has passed its culmination, and is descending upon the breast, by which these antagonists, are put upon the stretch, so that their physiological or muscular force, combined with their physical, elastic or resilient force, may so augment as to equalize or modify the induced and gravitating forces resident in the flexors. Hence, the sum of all these forces or the resulting force, is uniform; the hand passing through equal spaces in equal times. Herein is seen a beautiful combination of physiological and physical dynamics upon the principle of mutual compensation—an aggregation of forces maintaining towards each other definite ratios—elasticity and gravity, a latent and a free force, resulting in an uniform motion. Many circumstances, however, often occur to derange this harmony of forces. It is sufficient to mention rigidity.

After an interval of ten minutes, percussion was repeated—the iron bar being still in the palm:—the arm arose towards the vertical about 45 degrees,—the induced force was insufficient to complete its orbit; but instead of falling back to its original position, agreeably to the law of gravity, the hand was *deflected* diagonally towards the hip, which it came in contact with near the floor, illustrating the same law of compound forces, that is, the free or positive force was modified by the latent antagonistic force, and by the forces of elasticity and gravitation, resulting in a physico-vital force, the mean of all these motory elements conjoined.

In less than five minutes all motion ceased in the arm; but in half an hour its contractile power had returned, and the arm was raised as in the preceding experiment, but each succeeding elevation diminished, until the force appeared to be entirely expended again, when the experiments ceased, though, possibly, the contractility may have been reinforced afterwards.

VI.—August 28. A. R., dead half an hour. *Caloricity*.—Axilla 5 m. 106° —5 m. $107\frac{3}{4}^{\circ}$ —5 m. 108° nearly. *Contractility*.—This was moderate, but increased for a time. In two hours it declined considerably. The right arm was now carried over the throat to the left, and was placed as in case IV; the deltoid and a portion of the triceps were struck. The arm, dragging the flexed fore-arm across the chest, was extended, but lacked twenty or thirty degrees of forming a right angle with the body. This experiment was repeated several times.

VII.—August 23. J. F., born in Ireland, aged 19, resident 9 months; well proportioned, the bony and muscular systems rather predominant. *The Agony*.—Nearly pulseless; eyelids slightly parted; eyes upturned; the pupils contracted; mouth open, the under jaw forcibly drawn downward; respiration irregular, with loud stertor, causing the larynx and wind-pipe to descend and ascend to a great distance, with much force; the breathing became more difficult, and more limited to the bronchial

tubes and trachea ; total insensibility. In about half an hour the eyes opened with a stare, which continued until death ; the globes oscillated to and fro with great rapidity, doubtlessly from the involuntary contractions of the *recti* and *obliqui* muscles, but so quickly that it was impossible to decide at any instant which set acted. These oscillations or tremblings of the eyes were preludes to a general rigidity or tetanic stiffness of the neck and trunk ; in about ten minutes, the muscular equilibrium was for an instant broken, that is, the antagonism of the right side was overcome by the muscles of the left ; the body curved laterally, and the eyes lost their parallelism at the same time. This muscular agony lasted from thirty to forty minutes, during which a series of indescribable wave-like contractions of the muscular fibres were seen to pass beneath the integuments, chiefly on the trunk. No entire muscle seemed to act at the same instant, but portions of its fibres oscillated convulsively and irregularly ; sometimes in undulating lines, which trembled along their summits. These agitations, which were the most striking in the muscles of the eyes and of the chest, continued to augment ; the respiration became more and more limited to the air tubes, in which, mucosity accumulated, causing rattles. The skin of the face and neck became congested and cyanosed. The muscular convulsion having reached its acme, gradually declined, each fibre trembled less and less. The respiration was now wholly tracheal. The pupils now dilated enormously. The impression produced on the observer's mind was that of a muscular convulsion, in which each muscle, if not each fibre had a particular agony of its own. The death of the lungs and heart, that is, the respiration and the circulation seemed to have been caused or at least accelerated by this general muscular spasm. The breathing and muscular agitations ceased for more than a minute, when an universal muscular convulsion or rather a shock ran over the entire body—a few respiratory gasps, not extending to the lungs, followed. The muscles ceased to quiver. The agony had lasted three quarters of an hour. Death was complete.—*Ante-mortem calorificity* : Axilla 10 m. 110° —10 m. $110\frac{1}{2}^{\circ}$; hand 5 m. 107° ; axilla 10 m. 110° . Death.

Ante-mortem rigidity.—The under jaw was depressed by an apparently constant force, during the entire agony, keeping the mouth open. This was not a relaxation or falling of the jaw, but an active contraction of the muscles which depress it—a phenomenon, which I have seen several times in both adults and children, hours before death from fevers, not to mention a similar appearance in infantile lock-jaw. The moment the breathing ceased, the nurse, a strong man, attempted to bring the jaws into contact ; the fingers were placed on and near the base of the nose and on the cheeks, the thumb under the chin ;—force was applied several times for about a minute, but with little effect. The rigidity had evidently set in *before* death. I have more than once observed in the abdominal, especially the *recti* muscles, a similar *ante-mortem rigidity*, which seemed to have reached nearly to its maximum during the agony.

Post-mortem calorificity.—Axilla, 25 m. $110\frac{1}{2}^{\circ}$ —10 m. 110° ; bend of the arm 107° . The cadaver was now carried to the dead house—stripped—laid out in a sheet. Pupils now but little dilated ; general rigidity ; the muscles of the abdomen were rigid ; thumbs strongly flexed

within the semi-flexed index finger; the other fingers were strongly bent into the palm, requiring great force to straighten one at a time. After a number of efforts, during which the muscles and ligaments made a cracking noise, the rigidity, which was great, was finally overcome at both the elbow and the shoulder joints; the limb was artificially flexed and extended several times. The arm was now extended—the biceps struck. The flexion was perfect. The hand was carried to the abdomen with an uniform motion, three times. The fourth blow produced no effect. The heat of the axilla, an hour after death, had descended to $107\frac{3}{4}^{\circ}$ only.

This case may appear to contradict an assertion in the preceding part of this paper, namely, that the *rigor mortis* and contractility are contraries. Perhaps this language is too strong, or rather not sufficiently explicit. For although rigidity is an insuperable barrier to contraction, it does not always imply the absence of the contractile force. At the same time, the occasional coincidence or co-existence of these forces furnishes no proof whatever of their being *identical* in nature. Many facts and reasons could be adduced to show that they are wholly different, even when contemporaneous. But this is not necessary in a matter which is self-evident. I have on a former occasion published cases illustrative of the aberrations, not to mention the spontaneity of contractility, showing that it may decline in the cadaver for a time and then revive; and that the muscular *nisus* of the biceps may be strong without moving the forearm, owing to the *rigor mortis* prevailing simultaneously among the pronators, supinators and extensors, fixing the elbow joint. Rigidity and the contractile force, in its latent state, may for a time run parallel with each other, without affording any presumption of identity. This coincidence in point of time is supposed to be a fact wholly new, and opens a field for speculation. Broussais regarded *contractility as the fundamental principle of life*: “Contractility and sensibility are the evidences of the living state: contractility belongs to *all* the fibres; sensibility is one of the modes of action of the encephalo-nervous apparatus.”* The *rigor mortis* has been viewed as the extinguisher of contractility, and, therefore, as the most certain sign of real death, putrefaction excepted. Is not this erroneous? The *rigor mortis*, like a strong man, *binds* the weaker hand and foot, but this does not necessarily *kill* him. The cords will prevent the latter from walking, but do not prove him to be dead or without motory force. In the same way the contractile force may be bound by the *rigor mortis*, so that percussion and electricity shall utterly fail to develop the natural phenomena inherent in the muscular tissue. If, therefore, contractility be the test of life, or life itself, its absence cannot always be inferred from the fact, that contractions do not follow the application of galvanism; or in other words, the great majority of the learned, in asserting that contractility, especially when excited by galvanism, is the test of life, or rather its absence the test of reality of death, assert a hypothesis only. It is remarkable, with respect to the nature of many recondite principles or ultimate facts, as death for example, that the learned and unlearned stand on a perfect equality. Philosophy may without shame

* Princip. Phys. Med. 10. Prop. vi.

or reproach adopt, in many instances, the popular notions concerning the nature, if not the laws of life, death, etiology, gravitation, matter, mind, force, muscular power, &c.

Dr. Reid regards as self-evident, that active power exists as an attribute, but "whether it can exist in a subject which has no thought, no understanding, no will, is not so evident. Des Cartes thought matter, and a certain quantity of motion given to it by the Almighty at first, to be all that is necessary to make the natural world. Leibnitz conceived the whole universe, even the material part of it, to be made up of *monades*, each of which is active and intelligent, and produces in itself, by its own active power, all the changes it undergoes from the beginning of its existence to eternity."* No force in nature approaches the muscular force in the light of a independent and positive existence; in fact, it may be not a mere attribute, but an entity (though imponderable and invisible) in which attributes inhere, many of which have been already mentioned; motion is one of its conditions;—it may be increased, diminished, exhausted;—it may oppose or coincide with that simplest law of matter, *inertia*; it bears no resemblance to chemical attraction or gravitation; both of which are attributes of matter, constant and simple. But far be it from me to call such speculations, discoveries.

[† In uterine diseases, the organs secondarily affected, are for the most part, those affiliated with the ganglionic masses and their cords. A young married woman, now convalescent from an attack of yellow fever, afflicted for several months with prolapsus uteri, complains chiefly of gastric and œsophageal symptoms. Not long since, I was called to see a negress, for seventeen years a slave in the family of a merchant of this city. During her treatment, (for cholera,) it was ascertained that she had prolapsus uteri, which had existed many years. This woman, aged about 35, can give no account of the origin of the prolapsus; and never having made known her situation, she probably thought it was natural. I have not met with any case of reported prolapsus so complete as this, not even in Madame Boivin's works. The vagina is completely inverted; its tissue nearly white and dry like the skin, as is the uterus. The latter is of the usual size, and is quite as external as the male scrotum. Menstruation is regular, the mammæ normal. Her mistress, (an accomplished and humane lady,) had observed that this slave, though generally healthy, occasionally became suddenly indisposed, and once fainted. Doctors were called in, and the girl was treated for disease of the heart. The symptoms did not indicate *eccentric or other disease of the spinal cord*, but disturbances among the organs associated with the ganglionic system. I have never seen in any disease vomitings so obstinate, as in some cases in the advanced stage of cancer of the uterus. Now according to the reflex system, all these maladies are, or ought to be *eccentric diseases of the cord*. *Eccentric tetanus, eccentric convulsions, &c.*, might be expected, or at least, strongly developed secondary spinal affections.]

Cases I and II, in which the phrase, *Post-mortem capillary circula-*

* Es. I.

† This paragraph was omitted in the proper place. It relates to the reflex speculations on obstetrics.

tion is used, by no means give a tolerable illustration of the doctrine indicated, in relation to which, I possess ample experimental proof.—Although I am engaged in preparing a medical work which absorbs my time, yet, the reception which my “Researches on Post-mortem Caloricity”—“Researches on Post-mortem contractility,” &c., have met, is a strong inducement with me to offer before many months, “Researches on Post-mortem Capillary circulation,” not so much to establish its physiological truth, as to develop its fundamental importance in the pathological anatomy of fevers, and, indeed of most other maladies of an acute character, in which hyperæmia, congestion, inequilibrium of the blood, constitute a leading principle;—all of which may in a few hours, nay a few minutes after death, be modified, or even obliterated by the post-mortem action of the capillaries. Whether the experiments and the doctrines of the post-mortem capillary circulation, which I may offer, will draw upon me another controversy, time will show.* Lest a question of priority should arise, I now state, that my experiments began in 1841;—the germ of the doctrine, illustrated by a number of cases, will be found in the *Western Journal of Medicine*, for April, 1843.

There is a grand hiatus to be filled up in physiology, pathology, and morbid anatomy, comprehending the agony, the general death, and the first hours thereafter—a brief era, which, nevertheless, presents a concentration of phenomena, not to be learned thirty-six hours after death, (the usual period of European dissections)—a period which presents three principal points of departure, namely, caloricity, contractility, and capillary circulation, not to mention gravitation, imbibition, coloration, and other changes antecedent to putrefaction.

I intended to conclude with a rapid survey of the functional and structural diseases of the contractile tissues; but this paper is already too extended.

I will only add, that among the earliest symptoms of yellow fever, is a muscular aching like that which follows excessive exercise,—described by the patient as soreness of the flesh, as if tired all over, particularly in the great muscles along the back which sustain the trunk, and in those of the legs. In the latter, cramps are not uncommon. This muscular *malaise* is not simply a loss of force or debility. The patient's strength often is considerable until the close of life; nevertheless, as a preventive and as a means of cure, *perfect muscular quietude* is of the utmost value. Muscular apoplexy sometimes takes place in yellow fever, impeding motion, and causing much uneasiness, and even preventing the extension of the limbs. Masses of coagulated blood are found among the fibres, but more generally in the interspaces of the

* I can scarcely hope that the reader will admit, to the fullest extent, my dislike to controversy, seeing that I have been so much engaged in it; yet, I have never acted without the advice of those who were more competent to judge than myself; though, my friends are not, of course, answerable for the manner in which I have acquitted myself. The controversy, as to the originality of my researches on Febrile Caloricity has resulted in the magnanimous concession of the chief point contended for by me, in opposition to Dr. Ranking, of London, as may be seen in that gentleman's valuable Abstract;—(ii. 246, June, 1846.)—thanks, to the disinterestedness of Professor Lee, of New York, and to the Editors of the *New Orleans Medical and Surgical Journal*.

muscles, varying in quantity from minute points to several pounds. The fibre is never pale; on the contrary its color is usually increased. No lesion of the human body is more curious than that of the *muscular tissue of the bowels*, in fevers of an acute character in New Orleans, and although I have the materials for ascertaining its proportional, or rather its approximate frequency, I have not the leisure to count. This lesion, chiefly of the cæcum, colon and rectum, consists in the *firm contraction of the bowel into a round cord, elastic, white, bloodless, obliterating not only the cavity of the great intestine, but even its notchings, puckerings, and sacculated pouches*. Another lesion, that is, *intus-susception*, though less frequent, is doubtlessly a *muscular disease or irregular action* of the muscular coat of the small intestine. A careful dissector will occasionally, perhaps frequently find from two to six complete *intus-susceptions* in the same subject—one portion of the bowel having descended within another several inches.

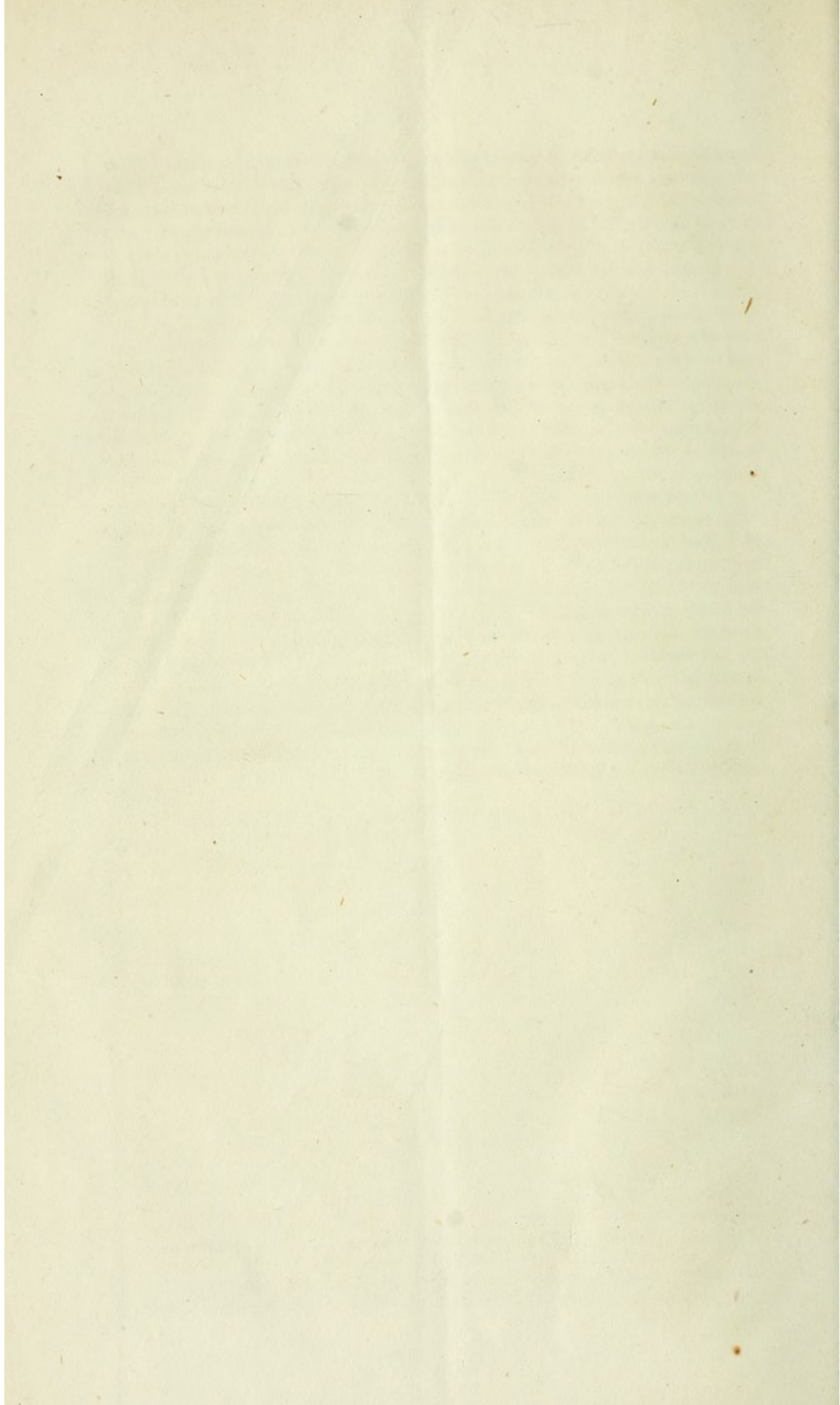
I give a case from memory, not having time to search the original MS. A stout, young Scot, taken with the yellow fever in the evening, was soon after bled largely by an apothecary, and was freely purged with senna and salts. Next morning his physician ordered that blood-letting should be repeated, until fainting supervened. This required fifty-four ounces of blood. In the evening I saw the patient. He said he was sinking and would die, that he had a strong *nisus* or straining in his bowels since the blood-letting, but could pass nothing. His strength was such that he got up, and endeavored in my presence, for ten or fifteen minutes, to evacuate the bowels, but in vain. He died during the night. The post-mortem examination, which I made the next morning, showed that the bowels were completely empty, but obstructed by six *intus-susceptions*.

muscles arising in quantity from the points to several pounds. There is never pain; on the contrary, the color is usually increased. The lesion of the human body is more common than that of the muscular tissue of the bowels, in favor of an acute character in New Orleans, and although here the materials for acquiring the purulent or tubercular disposition are abundant, I have not the lesion in man. This lesion, chiefly of the caecum, colon and rectum, consists in the firm contraction of the bowels into a round cord, white, bloodless, adhering not only to the cavity of the great intestine, but even to adjoining vessels, and undecomposed particles. Another point that is interesting, though less frequent, is doubtless a muscular disease or irregular action of the muscular coat of the small intestine. A fatal disorder will occasionally arise, perhaps frequently, but from 10 to six complete and unobscured in the same subject—one portion of the bowels having contracted, while another several inches.

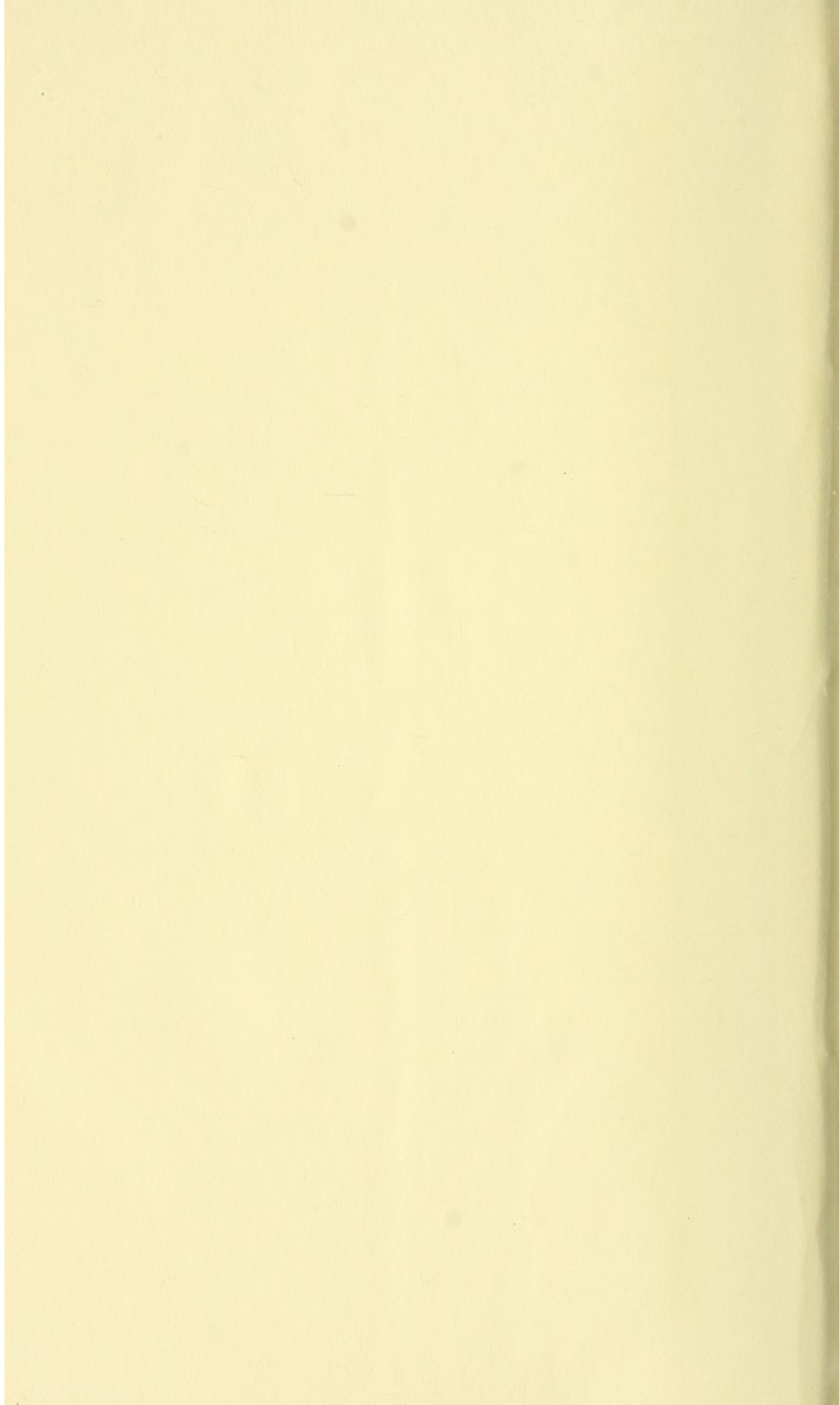
I give a case from memory, not far from that to which the original MS. is a neat, young man, about 20 years of age, in the evening was soon after breakfast by an indisposition, and was freely vomited with some bile. Next morning his physician ordered that blood-letting should be repeated until a strong superfluity. This repeated bleeding caused of blood. In the evening I saw the patient. He said he was sinking and would die, that he had a strong pain extending in his bowels since the blood-letting, but could pass nothing. His strength was such that he got up and subsisted in my presence, but was obliged to remain in bed, the bowels, but in vain. He died during the night. The post-mortem examination which I made the next morning, showed that the bowels were completely empty, but contracted by six fatal suspensions.

A second case is recorded in the MS. which occurred in the year 1817. It was a young man, about 20 years of age, who had been in the army for several years. He was taken ill during the night, and was found in the morning in a state of great distress. He was immediately bled, and the blood-letting was repeated until a strong superfluity was removed. He continued to sink, and died during the night. The post-mortem examination which I made the next morning, showed that the bowels were completely empty, but contracted by six fatal suspensions.

The above cases are recorded in the MS. and are of great interest. They show that the disease is not confined to the bowels, but may also affect the small intestine. The post-mortem examinations in both cases showed that the bowels were completely empty, but contracted by six fatal suspensions. This is a very unusual condition, and is doubtless a muscular disease or irregular action of the muscular coat of the small intestine.







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