*Hegelian Law, Mathematics and Physiology.** By J. H. Balfour Browne, Esq.

These admirable lectures upon the Philosophy of Law are not given to the public for the first time in the present volume. Originally delivered before the Juridical Society of Edinburgh, in November, 1871, they were published in the Journal of Jurisprudence in the four first months of the current year. From thence they passed, by appropriation, it is presumed, into the pages of the Journal of Speculative Philosophy, an American periodical, and are at the present time, we have reason to believe, being reprinted in book form in St. Louis, Missouri. Now we might conclude that lectures which were worth all that delivering, printing, and reprinting, had certainly some value. But demand is not always a good criterion of merit in literature; nay, so little is it so, that it is frequently the most worthless books that have the largest sales, and those which have fewest merits have the most readers. When such is the rule, it is a matter for congratulation to find such a noteworthy exception as that which is before us. It is satisfactory to find one work which is really valuable highly thought of, to find that a book which is in every way admirable has a real marketable value, and has found favour in the eyes of publishers both in this country and in America.

Even if Dr. Hutchison Stirling's name was not upon the title-page of this book, such a history of popularity and demand as that we have alluded to would make some notice of this work at our hands expedient. But Dr. Stirling is more than favourably known to us. The author of the "Secret of Hegel," which contains the best metaphysical work which has been done in this country for a very long time—the translator and annotator of Schwegler's "History of Philosophy," the able critic of Hamilton's "Philosophy of Perception," and the antagonist of Professor Huxley, in his relation to the Theory of Protoplasm—can naturally command attention for any words he may utter in relation to Philosophy, whether that be the philosophy of law, or the metaphysics of Astronomy or Fluxions. But have we here in a journal devoted to the exposition of Mental Science anything to do with law? And does not Dr. Stirling profess too

* Lectures on the Philosophy of Law, together with Whewell and Hegel, and Hegel and Mr. W. R. Smith, a vindication in a Physico-Mathematical regard, by James Hutchison Stirling, F.R.C.S., and LL.D., Edin. London: Longmans, Green, & Co. 1872.

much? Does he not desert his "last" when he handles Law, Physiology, and Mathematics? To-day we find Dr. Stirling exposing what he believed to be the fallacy of some clever writing of Dr. Huxley in relation to a question purely physiological. To-morrow Dr. Stirling is dealing with the labours of Trendelenburg, Röder, Hildenbrand, Heron, and Austin, and discovering in the too highly praised works of the last of these much incompetence and numbskulledness. But further, in the work before us Dr. Stirling "falls foul" of Whewell, and shews, not only his ignorance of German, but his incapacity for the criticism of Hegel, which he so gratuitously undertook; and at the same time he deals summarily with a Mr. W. R. Smith, who thought to prove that Hegel had attempted to "establish the calculus on a new and very inadequate basis." Now, it might seem that Dr. Stirling, who professes to be nothing but a metaphysician, was going out of his way to deal with law, with physiology, with astronomy, and with the higher mathematics. That is, however, an entire mistake, and as it has caused infinite confusion with reference to Hegel, has caused these strictures in answer to which Dr. Stirling now lays these Vindications before the public, it is of the utmost importance that this matter should be thoroughly understood. An explanation of Hegel's position in reference to these matters will make it evident that, in relation to Physiology, Dr. Stirling is simply defending the logical category of difference against that which is only equally authentic—identity, which is alone predicated by Professor Huxley; that in relation to Law, he is dealing with the philosophy which gives its sanction to all excellent legislation, and not with the particular laws which are so sanctioned; that as against Whewell, he is vindicating Hegel against a mistaken belief that the great German had really tried to throw discredit upon Newton's law of gravitation, and on the mathematical proof of Kepler's laws in the Principia; and lastly that, as correcting the errors of Mr. W. R. Smith, he is vindicating the metaphysical position of Hegel in reference to the Calculus, and that everywhere and always he is simply philosophical. These facts indicate why a notice of these lectures and vindications should find a place in this Journal. The interest of the questions involved will show the importance of becoming more thoroughly acquainted with these able expositions than it is in our power to make the reader in this place.

There was a necessity for these lectures upon the Philo-

sophy of Law. We had come, in these days, to regard all laws simply as matters of expediency, as matters without much meaning but emergency. Our lawyers know the law but not the reason of it. They know the practice (from Daniell and Chitty) of all the courts except the ultimate court of appeal. Mr. Carlyle has well said—"And truly, the din of triumphant Law-logic, and all shaking of horse-hair wigs and learned-sergeant gowns, having comfortably ended, we shall do well to ask ourselves withal, what says that high and highest Court to the verdict? For it is a court of courts, that same, where the universal soul of Fact and very Truth sits President; and thitherward, more and more swiftly, with a really terrible increase of swiftness, all causes do in these days crowd for revisal, for confirmation, for modification, for reversal with costs. Doest thou know that Court; hast thou any Law-practice there? What, didst thou never enter; never file any petition of redress, reclaimer, disclaimer, or demurrer, written as in thy heart's blood for thy own behoof or another's, and silently await the issue? Thou knowest not such a Court? Hast merely heard of it by faint tradition as a thing that was or had been? Of thee, I think, we shall get little benefit.

"For the gowns of learned serjeants are good: parchment records, fixed forms, and poor terrestrial Justice, with or without horse-hair, what sane man will not reverence these? And yet, behold, the man is not sane but insane who considers these alone as reverable. Oceans of horsehair, continents of parchment, and learned serjeant eloquence, were it continued till the learned tongue wore itself small in the indefatigable learned mouth, cannot make unjust just. The grand question still remains, Was the judgment just?"*

That of a surety is *the* question, and how is that question to be answered? Not by any expediency or consent doctrines, but by a reference to the laws of which all our written or unwritten laws are, if they are just and right, simply excerpts, by a reference to that legislative enactment which is written within us, and which legalises or annuls all the acts which are passed by our Parliaments and signed and sealed by our Royal Commissions. Now the question is—what these laws are, how are they enacted? To discover them, and their self-sanction we must have recourse to philosophy, and, in this instance, to the philosophy of Hegel.

* Past and Present. B. i., ch. 2.

The question which has so often failed of solution is how the many of nature can be reduced to the one of thought?

All science, all philosophy, has been tending towards the answer to this question, and tending to that union which seems to be so eagerly desired by some, while it is as energetically repudiated by others. But notwithstanding the stupid abhorrence of some so-called practical scientific men, of what they ignorantly believe to be philosophy; notwithstanding the hostile attitude which has been assumed by many of the followers of what they are good enough to call the exact sciences with regard to metaphysics, it is certain that science never can be exact, unless it is sanctioned by a true metaphysics, unless it has its verdicts confirmed by that higher court of appeal—philosophy.

The *scientia scientiarum* is an indispensable. All science is explanation, but explanation itself requires to be explained, and that explanation of explanation, or explanation in itself, is philosophy. Now as science has been tending to the reduction of the many to a one, as all classification is nothing but science, and that process, so has metaphysics been tending to the still further unification of the many of science in the one of thought. The object of philosophy has been to find some basal and self-based explanation of thought. Now this, which has to our thinking been at last effected, has not been the work of one man but of many. Thoroughly to understand the Hegelian theory of self-consciousness, one must, as Dr. Stirling points out, understand the main drift of the labours of all philosophers, from Thales to Schelling (p. 71), and we may say that one of Dr. Stirling's greatest merits is his admirable power of statement of creeds. Nothing could be better than his statement of the contents of Kant, contained in his article in the October number of the "Fortnightly Review."* Here, in the first of these lectures upon the philosophy of law, we have equally good accounts of Kant and Hegel in their relation to each other. These statements, which only extend over a couple of pages, are the rich results of years of labour. To get the central notions of such men, one must work laboriously through the hundred externalities which surround inner thoughts. And even when one is in the presence of that one vital thought, it requires keenness and power to know it and feel it. Such thoughts are always oracular. They come as Christ did, not easily recognisable as a king above men, but unrecognisable except to wise heads

* "Kant Refuted by dint of Muscle."

and good hearts; as a carpenter's son amongst the crowd of people. In no relation does the consciousness of Dr. Stirling's power force itself more resolutely upon us than in connection with these pithy expositions.

Once, then, having understood Hegel in his relation to the long generations of the thoughts of great men, and especially to the thoughts of Hume, Kant, Fichte, and Schelling, one might think oneself prepared to understand explanation as explanation, and, therefore, to understand all science, at least in its principles. Now that is exactly what Hegel felt himself to be; and that is one of the chief causes of the enmity which he has on some hands excited, and of the hard names that he has on many hands been called. All the professors of the sciences have felt that their science assumed a vice—a vicarious position—in the presence of Hegel's metaphysics, and have regarded the efforts that that hard man, with his edged intelligence, his iron logic, and his heavy momentum, has made to comprehend all science in his all-embracing philosophy as presumptuous.* Consequently, we find that Whewell resents his deliverances with regard to Kepler and Newton; while Mr. W. R. Smith accuses him of ignorance, pigheadedness, and self-complacent arrogance, simply because he (Mr. W. R. Smith), a young man, has not taken the trouble to understand Hegel, or, to be more merciful to his moral nature, because he had not intelligence enough to do so.

The mistake which has been made by Whewell, Smith, and the rest, is just this: Hegel never did profess to find fault with any one received physical principle; he neither thought of substituting a mathematical proof of Kepler's laws for that which had been offered by Newton, nor did he think of attempting to establish a calculus upon a new basis. "Hegel never," as Dr. Stirling remarks, "made a mathematical suggestion in his life" (p. 105). His work was not with physics as physics, but with metaphysics as such. He confined himself to the principles of the explanation, which was a part of metaphysics—which was, in fact, the *notion*—and took no

* Mr. Shadworth Hodgson, in his article upon the Future of Metaphysic, which appeared in the "Contemporary Review" for November, 1872, has admitted Hegel's merit in regard to the all-embracingness of his philosophy. But is it not evident, that that is the very test of the truth of philosophy? If philosophy is true, must it not inevitably be all-embracing explanation? It must be not only an answer to questions of existence as the *prius* of thought, as Mr. Hodgson thinks, but an explanation of the constitution of thought as the *prius* to the very idea of existence.

cognisance of the physical facts, or direct physical principles. Science is explanation of the many of the infinite out and out,—of externality, of nature; but metaphysics is the explanation of that explanation in its relation to the infinite in and in of internality. With the truth of the explanation of explanation as such, metaphysics has to do, and with the metaphysics of Kepler's laws, and the metaphysics of Newton's fluxions, Hegel did feel that he had a right to meddle. His objections are never mathematical, always metaphysical, and his preference for the metaphysical Kepler is only natural; while his objections to the metaphysics of the calculus are the same as those which are urged by Professor Thompson. The incompetence of such men as Whewell and Smith to deal with the questions which Hegel had in hand to answer is remarkable, and is pointed out with much skill and intense force of reason and expression in these most able vindications. No vindications could be more satisfactory than these; and had we not another more imperative object in writing this paper, we could desire no pleasanter task for ourselves, and no more thorough elucidation of this doctrine, and of Hegel's relation to science, for the reader, than a statement of the whole of the thought which these able criticisms contain and of the particular results of each. But as they are criticisms, and as we desire to point out a new relation of "*the notion*" to science—and one which may be of greater interest to the reader of this Journal—we must content ourselves with what has already been said, and with a very earnest recommendation of these to the favourable notice and careful study of our readers.

To understand the remarks which we are anxious to make with reference to what we regard as a remarkable confirmation of the Hegelian hypothesis, as derived from the most recent physiological discovery, it is absolutely necessary to understand Hegel's theory, and it is even expedient that we should have some idea of Hegel's relation to Kant.

The great problem of philosophy has at all times been to reconcile the external to the internal. How mind could be cognisant of matter has been a question of the utmost difficulty. Some have avoided the difficulty by simple assertion—the asertion of mind and of matter, and of an incognisable relation between the two. But the days for the reverence of incognisables has gone by. We have, for the most part, come to admire knowledge rather than ignorance, and the stupid prejudice which makes the term rationalist a reproach, is in-

dicative simply of foolishness. Reason is the best part of a man, and the only thing in which a man is man. When he lives in his appetites he is on a level with the beasts; when he lives in his feelings he is ascending in the scale of being, but still he is a waif at the beck of Nature; and it is only when he reasons, and when his reason passes over into will, only when thought determines itself in passing over into act, that he becomes a true man—a knower, a sayer, and a doer. Then why make rationalism a stigma? Why turn that weathercock, the finger of scorn, which is turned about by a breath of the majority, upon the man, because he reasons, because he has the quality which is common to him with God, instead of that quality which is common to him with pig or hippopotamus? Therefore the incognisable will not be a refuge. A more thorough desire to solve the problem than that which is satisfied with a crossing of the hands in ignorance, has pressed on to a real answer to this most difficult of questions. At one time the difficulty was so great that abstract ideas were invented, with a view to the solution of the problem. Berkeley followed with his subjective idealism or sensationalism. Hume followed close upon Berkeley, with his scepticism, and as Dr. Stirling, in some of his writings, seems to think, with his sleeve-concealed laughter, and his denial made an assertion of the absolute facts necessary; and Kant was, as to his philosophy, the natural outcome of the sceptical grin of our own Hume. Now Kant's result was this: he asserted that "the sensation of the various special senses received into the universal *à priori* forms of space and time, are reduced into perceptive objects connected together in a synthesis of experience by the categories." This is in effect the cognitive theory of Kant; but an unfolding may be necessary. Mind being presented with an object, is in its unity in presence of a manifold, and in knowing the thing the mind has to connect the units of this manifold into a one, and reduce it into itself. But the ego in act is judgment—and judgment has twelve subordinate forms or functions, and these functions arrange themselves under the more general functions of quantity, quality, relation, and modality. The subjective factor then in a cognitive attitude is now conceivable. The objective factor is still a manifold of special sense in space and time. But space and time are not sensations, because they are not due to any special sense, and they have not objects like other special sensations; and they are not notions, for viewed in the relations of wholes and parts they have in such

aspect the constitution of something sensuously perceived, not of something intellectually understood. But time and space are, nevertheless, to Kant universal and necessary, and consequently he pronounced them general perceptive *à priori* forms—in the mind as necessary pre-conditions of special sense. But special sense is simply a subjective affection; but still that subjective affection is in relation to the transcendental object.

Now Hegel modified these results of Kant. "To him," as Dr. Stirling truly remarks, "Kant's great want was that of *process*—process deductive, process inter-connective." For Hegel the whole universe must be derived from the constitutive act of the ego. The ego must have a self-developing principle in it. It must be a law to itself. The rhythm of its action must be self-imposed, inherent, for Hegel, and in that particular Hegel transcends Fichte, who had been content with an external law of thesis, antithesis, and synthesis, through which imposed law he supposed the ego to develope "into its own constitutive variety."

But Hegel, if he was anything, was thorough, and he was in earnest to answer the question, not to shirk it. To answer it he felt that the explanation of the constitutive process of the ego must have nothing foreign in it. An ultimate explanation must contain its own grounds and reasons, and consequently for Hegel the ego's development must be an internal unfolding and inherent rhythm dictated not from without, but from its own inner nature. Hegel then leaves the somewhat bare and external theory of Kant, and in relation to him Hegel may be said to have held that the ego developes into its own categories, and that when these are complete externalization results from the same common law. But this development of the ego is not the particular ego—yours or mine—but the universal ego, and it is of some importance clearly to understand this distinction. The universal is mine and yours, and yet mine and yours is not necessarily the universal. We have a subjective and an objective side of ourselves, and that objective is more mine than the subjective. The objective is a part of the necessary evolution of the notion. It is not mine or yours, but mine and yours, and, because it is notional, it is the universal—the true. What is objective—what is universal—is more mine than what is subjective, what is particular, and hence, as Hegel so admirably points out, the justice—not the expediency of the state—the justice, not the expediency of

punishment. For punishment is the re-affirmation of the universal free-will as against the particular will or caprice of the individual, and hence punishing a criminal is doing him no wrong, but is doing him a right.

Hence, also, we may point out, arises our worship of great men. That never can die out of the human heart; men must love, must reverence their fellows, and hero-worship is everlasting. Because the hero is the incarnation of the universal, we feel him to be more ourselves than we ourselves are, and, therefore, we love and reverence him. "The poet," says Emerson, who has a glimmering of the real deep fact, "stands among partial men for the complete man, and apprises us not of his wealth, but of the commonwealth. The young man reveres men of genius, because, to speak truly, they are more himself than he is."

Now, the ego thus resulting in externalization is the universal ego; but, to appreciate this externalization, the reader must attempt to understand the difference between these two cognitive theories. With Kant time and space are, as we have seen, general perceptive forms native to mind; with Hegel they are the universals of externality, but externality is not more necessary, objective, and actual to him than internality is necessary, subjective, and actual. With Kant the ego is known phenomenally; with Hegel, the ego is noumenal. With Hegel too "externality as externality is an infinite out-and-out of infinite difference under *ir*rational necessity (physical contingency, &c.), internality as internality is an infinite in-and-in of infinite identity under *rational* necessity (Freedom [true Freewill], p. 72)." But we have more than once alluded to the constitutive act of the ego, and it may not be unnecessary, in case some of our readers may be unfamiliar with the writings of Hegel, or even unfamiliar with the writings of Dr. Stirling, to explain the nature of that constitutive act. Hegel's object was to explain rationally all explanation, and as we have pointed out, any adequate explanation, to be ultimate, must be competent to reduce into its own identity all the difference that is in the universe, and must at the same time bring with it its own reason for its own self—"its own necessity, its own proof that it is, that it alone is that which could not *not* be."

Here Hegel strikes home at vicarious thoughts, at the make-shift imaginations, which, like a depreciated currency, try to pass over the counters of men's minds, as if they were reasonable beliefs and true ideas. Here he exposes the shal-

low prétence of empty big words which contain spurious images, and of those pretentious Vorstellungen which would fain pass for true Begriffe. And, passing from this, Hegel finds that this self-development of the ego is to be found in the constitutive process of self-consciousness, which has resulted in the counterpoise of external and internal. And that that constitutive act or movement is the idealization of a particular through a universal into a singular, or otherwise the realization of a universal through a particular into a singular. Now that is the *notion*, and the *notion* is Hegel. This is the constitutive process of self-consciousness, and, therefore, the constitutive process of the universe. That process is the *prius* of all, is all; and hence we have that marvellous system, which is so admirably rendered by Dr. Stirling in these lectures into the most compact and crowded English, of evolution, the evolution of self-consciousness, into logic, nature, and spirit; the notional evolution of spirit into Abstract right, morality and observance; the further development of legality or abstract right into property, contract, and penalty, and the final division of property notionally into bodily seizure, formation, and designation. In each one of the developmental evolutions of objective spirit, which is really to Hegel and to us the whole of the philosophy of law, the reader will perceive the same triplicity or triunity of the notion, will perceive the same constitutive movement of a universal, through a particular, into a singular. To make this clearer, we may explain that to Kant and Hegel the freedom of will is a proveable fact. To them, law, morality, property, penalty, and all the rest of it; nay, man himself, in his concrete essence, is an impossibility, unless there is a free-will. To them free-will is moral necessity, and in *property* Hegel sees the singular will—the will of one positing itself in an object; in *contract* he finds the will of more than one, but still the particular will; while in *penalty* he sees the universal will, the objective idea in act of the state, which is in itself, and so far as it is just and right, a result in its essence of the notion.

It would be impossible to give the reader any adequate idea of the contents of these careful and invaluable lectures. In that respect this notice can only be a finger-post. And to understand the whole attitude of Hegel in this reference he must be content to read earnestly every word of these replete pages. One thing we wonder at, and that is how Dr. Stirling has been able to convey so much in so little. But

all genius has the same knack. Deep truths which a small man would thin-spread over a life's labours, the great man conveys in a sentence. The small man is like the young nation. In it all acts are ceremonials. A walk is a procession; amusement is a beating of drums and an ostentatious flapping of gaudy banners. As the nation grows older the ceremonials die out, the trumpets rust with the arms, the banners poison moths with their bad dyes; and so it is in a weak mind and in a strong. The small man externalises his æsthetics in plumes and slashed bucklers, while the great man goes none the worse for the slashing of his garments by the rents of age. And, while the small man makes a great cry about a little wool, and gives many words about a little thought, the great man is comparatively silent and lets his great thoughts jostle and elbow one another out of his full pages.

We cannot here say more with reference to these careful and admirable expositions.

We did, however, promise to illustrate Hegel's secret in relation to one of the discoveries of recent physiology.

The discovery to which we have referred has been made long after Hegel's time. Hegel died in 1831, and these important physiological discoveries were given to the world in the months of May, June, and July, in 1872. And yet it is surely evident that if there is any truth in Hegel's theory of cognition; if his notion is, as he held, the constitutive process of thought, and if thought is the universe, then it must be true as a metaphysics of any true physiology which has been discovered since his days. The correctness of the metaphysics or the ground of a science, is the test of the correctness of the science itself. What is not true in its connection to the principle of all thought, cannot be thought, and therefore it can only be accepted by those who are ignorant. But that which appeals from knowledge to ignorance is not science, but a make believe, and a sham! It may pass current with many, as a counterfeit coin does, but it is bad and worthless!

Now, in reference to Dr. Pettigrew's most able lectures upon "The Physiology of Circulation in Plants, the Lower Animals and Man,"* we are able to discover an under-

* These Lectures were published in abstract in "The Lancet" for May, June, July, and the first week of August of the present year. They are being published in their entirety, month by month, in the "Edinburgh Medical Journal," and my knowledge of them is drawn from these sources, as well as from a conversation with the author.

ground of true metaphysics, and although Dr. Pettigrew may be in utter ignorance as to the labours of Hegel, he has, through his purely anatomical and physiological researches, arrived at conclusions which are in conformity with the notional evolution of that great man. All true observation tends to supply the materials of true philosophy. Facts are little, but the essence of facts is much. You cannot get the wine of truth unless you have the sappy facts to throw into the winepress of reason. And Dr. Pettigrew has been gathering together most important facts which seem to us to be genuine, and from which the truth of the Hegelian metaphysics can be expressed. That his labours were done without any knowledge of the latest outcome of German philosophy renders them the more valuable to us. His unpurposed conclusions are, in our eyes, infinitely more important than any researches guided by a desire to prove a theory which he kept steadily in view. As we test the justice of all law by the principles of justice, so must we test the truth of Dr. Pettigrew's conclusions by the principles of all truth.

Dr. Pettigrew, who is perhaps the most distinguished disciple of Goodsir, must be known to all readers of the "Journal of Mental Science" as the discoverer of the arrangement of the muscles of the heart. In more recent times Dr. Pettigrew has devoted much careful attention to the physiology of flight as his most able monographs in the "Transactions of the Royal Society of Edinburgh" amply prove. And now we have, from his indefatigable industry, these most original lectures upon Circulation. At first sight it might seem that Dr. Pettigrew's labours had been too various. But just as we proved that what might seem erraticism in Dr. Stirling was the most constant fidelity to one subject; so it would be easy to prove that the researches of Dr. Pettigrew have a most philosophical continuity. Dr. Pettigrew is, in anatomy, a spiralist. He has proved that the heart is folded on itself, that the muscles of the heart are arranged spirally. That is his first discovery. His second is, that the wing of the bird is a hilex or screw, and that (owing to the two important discoveries made by Dr. Pettigrew, that the stroke of the wing is downwards and forwards, and that weight is one of the principal elements of flight), the stroke of the wing is a spiral, which in rapid motion untwists itself and becomes a rhythm or wave. Now, continuing his researches, he goes on to show that the heart is the type of all voluntary

muscles; that the chest, without the bone, is, as to its muscles, exactly similar in its arrangements to the heart, and that, as in Hamlet there is a play within a play, so in the human body there is a heart within a heart. But further, as the heart is the type of all the voluntary muscles, the arrangement of the muscles of the fore-limb about the bone is exactly similar to the arrangement of the muscles of the heart about the hollow cavity of that organ. There is one type, therefore, according to Dr. Pettigrew, throughout the entire organism, and that is the spiral. Now, what we have said proves the truth of our assertion, that this distinguished anatomist is a spiralist. But Dr. Pettigrew has gone further. He is not only a spiralist anatomically, he is spiralist physiologically. He not only finds that the organs are themselves constituted spirally, but he finds that their functions are spiral. He has never said so much in words, but a very little explanation will show that this is really his meaning.

Not only is the wing a twisted lever or hilex, but the stroke of the wing is, as we have already remarked, in the figure-of-8, which, so to speak, becomes unravelled into a wave track, or, in other words, in rapid motion the loop of the 8 and the recessions of the wing become infinitely little. Here, then, we have the spiral functions of the spiral organ. Again, we have the heart, which is a spiral twisting on itself, or, as it were, wringing itself, and projecting the "blood along the main vessels very much as a bullet is projected from a Minnie rifle," or, in his own words, "the heart is screwed home during the systole, and unscrewed during the diastole." Here, again then, we have the function spiral as well as the organism.

Again we have, in Lecture 10, a very admirable and entirely new explanation of the movements accompanying inspiration and expiration. Up to the present time it has been supposed that in inspiration the anterior wall of the chest and abdomen are both pushed outwards, and that in expiration both are drawn inwards. This is, as Dr. Pettigrew shows, an entire mistake. According to him the chest and abdomen open and close alternately, precisely in the same manner as the auricles and ventricles of the heart, the chest opening when the abdomen closes, and the abdomen closing when the chest opens. But here we have again a spiral. A wave of motion passes from the symphysis pubis in the direction of the ensiform cartilage, a reverse wave passing

from above downwards when the abdomen opens and the chest closes. "The lines representing the movements cross each other figure-of-eight fashion." And so it is throughout—the functions of all the organs are spiral. Therefore there is no want of accuracy in describing Dr. Pettigrew as a spiralist in physiology as he is in anatomy. But to understand the whole truth of this assertion, this spiral function must be more minutely explained. The tissues of body are nourished by imbibition, and that imbibition is made possible by the two currents of blood flowing in exactly opposite directions. Now this flow is caused by the spiral or double action of the heart—that of pushing and pulling, sucking and squirting, which go on at the same time, and are not two actions but one. Here we begin to perceive the metaphysical bearing of Dr. Pettigrew's researches. But not only is the action of the heart a concrete action, but all the tissues have a circulation of their own (particular) independent of the general circulation (universal). All tissues are in one aspect lungs. This double unity of action rising to a triunity in function is found everywhere, and what we want to show is that that triunity is nothing but the notion, that the rhythm which Dr. Pettigrew finds everywhere in nature is nothing but the rhythm of self-consciousness. This will not be difficult. The main fact of nature is counteraction, contradiction, or, as Dr. Stirling happily expresses it, *contre coup*. Externality stands over against internality, and the important fact is their antithesis. Infinite affirmation could be nothing, and it is only by returning on itself, only through negation that it becomes something, spirit realises itself, makes itself definite by externalisation, which is the negation of the thinking principle, and stands over against it. The internal or infinite *intussusception* is *in*, and by, and through the external or the infinite difference of the out and out. But this is an act of judgment, a notion, and the notion is the rhythm of self-consciousness—the schema of universal, particular and singular. Every concrete is a universal through a particular into a singular. This, then, is what Hegel wanted to prove; and in all Dr. Pettigrew's discoveries we find this same *contre coup*—this same concrete, which is a universal through a particular into a singular. In the spiral we find the true concrete as distinguished from a straight line, which in its self-isolation, in its non-return upon self, is abstract. It is in the figure of 8 that we find the type of the notional anti-

thesis; but this may be further elucidated. Dr. Pettigrew finds distinct rhythmic movements in plants and animals. That rhythm is, as we have endeavoured to show, a spiral, a return upon self. He finds that these rhythmic motions are the cause of circulation, and that all hollow muscles act in precisely the same way. The seizure of food in the œsophagus, and the dismissal of the bolus downwards (or, as in the case of ruminant animals, also upwards), is one act, and is precisely similar to the sucking and squirting of the heart, and the in-breathing and out-breathing of the lungs. Each of these is a concrete, at the same time affirmative and negative, not two, but one—a rhythm, a spiral, the out-going and the return of motion.

But this is true throughout. We find the same circulation in gases, illustrated by their diffusion; in fluids, in the endosmoses and enoxmoses, which may be compared to the *coup* and the *contre coup;* in the circulation which, as Dr. Pettigrew, referring to Seebeck, remarks, may be said to exist in metals. And to return to the bodily organism, and from the hollow muscles to those which are spirally arranged round bones, we find that "when a limb is to be flexed the flexor shortens and the extensor elongates. This does away with the necessity of the muscle which shortens forcibly dragging out that which lengthens, which is a mere waste of power."

Here, therefore, we have the same concrete. The affirmation cannot exist without the negation, the contraction cannot take place without the extension; or, as Dr. Pettigrew prefers to call it, the opening cannot take place without the closing. He even states (Lect. X.) that the muscles of the chest and heart are arranged in *antagonism* to one another. Now antagonism is the basal fact of concreteness. This is the same thing that we have throughout body, and that only because body is an externalisation of mind. The law of the universe is the universal concrete, because that law is the self-imposed law of thought. The concrete is the spiral thought; it is thought returning on itself, it is thought in the *contre coup*.

But the most important part of Dr. Pettigrew's discovery is with regard to the cause of all this. True, he is wrong in his ascription of causality, but he, even in his error, corrects a still direr mistake which other physiologists have fallen into. For a long time the world within us has been believed to be constructed by the world without. It has been the

object of physiology to prove that the architecnic principle of mind was matter. We have had various ingenious theories by which the organism of man has in all its parts been constructed by the conditions to which it was exposed. The eye was made by light, the ear by sound; the external conditioning was, according to some writers, everything; the internal was nothing but the conditioned. Spirit was clay in the hand of iron facts. The head was furnished by the world instead of the world being furnished by the head. This theory has pleased some people. The facile is always a temptation, and it is true, as Bacon has said, that rather than have no explanation at all, men will accept a superstitious one. True this was unacceptable to metaphysicians. It was impossible to accept it because it was unthinkable. It was only a pretended explanation, not a real explanation after all. Metaphysicians were, however, content to wait until physiologists had come to see the truth as to this matter, and in these lectures of Dr. Pettigrew we find that he has deserted this external method, and has accepted a more internal explanation. That explanation is an approach to the actual fact. In an early part of his course he points out that the rhythmic movements in plants (and his description of the relation of leaves and roots compared to external and internal skin, and of the endosmoses and exosmoses which goes on through a plant are especially admirable, and ought to be read in relation to Mr. Herbert Spencer's external method of accounting for various physiological phenomena in plants), are independent of nerve, muscle, and all these structures commonly regarded as essential to the kind of movement (Lecture IV.); and again in the ninth lecture, in speaking of the changes which take place in a muscle when it shortens (contracts), he says—"This implies the presence of two forces acting at right angles to each other, and to a power inherent in the sarcous elements of the muscle of shortening and elongating." While in the last lecture he asserts that the power of opening and closing in the several parts (of the heart) is inherent in the heart itself, and is not due to the impinging of the blood against the lining membrane of the heart, the blood acting as a stimulus; and he argues that if the blood acted as a stimulus it would cause the heart to contract before it had received its full quantity of blood, which it does not. And the same remark would of course hold with equal truth in relation to the passage of the contents through the alimentary canal. Indeed, it is obvious that if it were the

stimulus of the bolus which caused the action of the throat, the action would be exerted at the point of contact, and therefore in a direction contrary to that in which the food passes. While under the circumstances of inherent rhythm or wave movement, there will be both a pulling and pushing action exerted on the food, in the same way that the heart at the same time sucks and squirts the blood. But one more reference to Dr. Pettigrew's theory. In the same lecture he again asserts that the heart moves in virtue of a power inhering in muscular substances or in the nerves and ganglia which are so plentifully distributed thereto.

Here we see that he has rejected the external explanation of muscular movement which has been for so many years in vogue. He cannot even hold that this power is peculiar to muscular or nerve substance, as he finds precisely the same rhythmic movements in plants which have neither of these structures; and therefore while we hold that he is fully justified in rejecting the stimulus theory as mechanically impossible, as physiologically bad, and as philosophically absurd, we cannot hold that he is right in ascribing the rhythm as an inherent property of organic structure. Indeed, he almost shows that he is, in that particular, wrong by his allusion to the circulation of electricity in metals. (Lect. IV.) For it proves that the same law is to be found in the inorganic as well as the organic. Now, to understand the meaning of this rhythm we prefer to accept the theory of Proklus rather than the no-theory of Dr. Pettigrew. "The mighty heaven," said Proklus, "exhibits in its transfigurations clear images of the splendour of intellectual perceptions, *being moved in conjunction with the unapparent periods of intellectual natures.*"

And what is true of astronomy is true of physiology. The rhythm which, according to Dr. Pettigrew, inheres in muscle inheres only in mind. We have seen that that rhythm is the rhythm of self-consciousness; and that that inheres in mind and mind only is surely evident. "The universe," says Emerson, following Berkeley rather than Hegel, "is the externalization of soul," and, if that is so, what should we expect to find in the universe but the traces of that mental process which in the development of its categories results in externalization? Is it to be wondered at that we find the notion in physiolcgy, in law, in mathematics? Would it not be the miracle of miracles if that were not the case?

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We fear that we have done but scant justice to Dr. Stirling's very admirable work which lies before us. When we have said that nothing could be more excellent in Hegelian reference than these lectures upon the philosophy of law, and this vindication of Hegel's system in a physico-mathematical regard, when we have said this much, we hope that we have said enough to convince our readers that this work is worthy of the most careful attention and untiring study. Hegel is, with the exception of Kant, the strongest headed man that has devoted himself to philosophy since the time of Aristotle. That he accomplished more than his great predecessor was, to a great extent, due to Kant's failure. Where another falls, we may stand in very virtue of his mishap. And that he has accomplished much none can doubt. There has not, indeed, been any philosophy since his day, notwithstanding the assertions and self-assertions of Mr. Hodgson in the paper already alluded to.

Nay, we might even prophecy, as Dr. Stirling does, that the work of philosophy, for a long time to come, must be simply the explication of the great implicit content of Hegel. With a view to a partial effort in that direction, we have, in this essay, called the reader's attention to the metaphysics of the most recent, most ingenious, and most original researches in relation to physiology. And we must here quit the subject with an expression of our deep sense of indebtedness to Dr. Stirling for work which he alone in this country, nay even in Germany itself, was capable of doing. That it has been done with care, with thorough metaphysical ability, and with genius, we are happy to be able to report, as we were previously prepared to expect. Dr. Stirling is our greatest—almost our only great metaphysician.

Illustrations of the Influence of the Mind upon the Body in Health and Disease, designed to elucidate the Action of the Imagination. By DANIEL HACK TUKE, M.D., M.R.C.P. London: J. & A. Churchill. 1872. 8vo., pp. 444.

Much has been written, both in prose and verse, by men of science and writers of fiction on the influence the mind exercises on the body. In the daily practice of our profession we talk about it, glibly ascribe the origin of many symptoms and the removal of others to the imagination,