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The physics of idealism

THE PHYSICS OF IDEALISM

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TABLE OF CONTENTS.

INTRODUCTION.

In discussing the attitude of idealism towards the metaphysics of natural science one is embarrassed at the outset by the indefiniteness of the term idealism. Systems which are called idealistic differ radically in character, as do those of Leibniz and Berkeley. Many of them exhibit features which are supposed to be characteristic of realism. Yet the distinction between realism and idealism is a time-honored one, and cannot be without significance. It is therefore important to determine with some precision in what this distinction consists.

Two criteria often used to make the distinction appear to the writer to be of very inferior value. According to one, an idealist is a thinker who denies that the external world and the objects of knowledge possess a reality independent of the perception or thought by which they form a part of his consciousness. Their *esse* is *percipi*, and in addition to their reality as perception no sort of existence can be ascribed to them. The realist, on the other hand, urges that things exist by themselves, and that afterwards a knowing mind may happen to perceive them—or it may not, the incident being of no great significance.

There is no doubt much excuse for resting the distinction upon the denial of an objective world independent of consciousness. The general contention of idealism, both in England and Germany, has been that the reality of the object consists in nothing else than being perceived. Except as related to consciousness, it is urged, no meaning can be ascribed to objectivity. With Berkeley insisting that the *esse* of things is nothing but their *percipi*, and with Fichte striving to show how the Ego constructs the world by its own spontaneity, the

foregoing characterization has seemed just and has won wide acceptance.

The extreme subjectivism which this statement of the idealistic position entails is a matter of regret. Wherever it is dominant idealism fights at a marked disadvantage. The suppression of subjectivism has been the perennial struggle of the idealist.

The idealist does not actually mean that the mind of the individual constructs for itself a field of consciousness which is its universe, and that the universe so known carries with it no implication or evidence of an existent reality external to the consciousness of the individual mind. He can no more dispense with such a reality than his opponent can dispense with the material world. It is the principle which makes the world a system, and causes the universe constructed by one mind to harmonize with that constructed by another. From the standpoint of the individual, this may be called an external world. It is not external to the mind, if by external we understand something opposed to the mind and distinct from it. On the contrary, for most forms of idealism this universal principle must be immanent in the mind, and may in this sense be called internal. It is external, however, in the sense that it involves immensely more than the consciousness of the single individual. Its sphere of activity lies largely outside the consciousness of the finite subject, and it is in this extra-mental sphere that we must find the ground and explanation of the cosmic order.

Berkeley eliminates from his philosophy the material world, but he is able to do this only by calling to his assistance the mind of God. The perceptions of objects are aroused in the conscious subject by God. It is clear, therefore, that the existence in my mind of a given perception does involve some evidence of a universe external to myself. It implies the activity of God. When Berkeley urges that its *esse* is *percipi* and nothing more, he is impelled by a motive which he does

not really understand or properly state. His real motive is to deny that subject and object are given in absolute dualism; to assert that the two are given as differences in a common principle, and in the medium of mind-life. Epistemological necessities led him to accent the mental medium, and even to treat it as the perceptual act; but he did not rigorously and consistently restrict the entire reality of the object known to the perceptual product. Berkeley was concerned, it is true, more with the destructive argument against materialism, and gave only an imperfect development to the positive aspect of his system. Until this aspect is satisfactorily worked out, however, Dr. Johnson's refutation of Berkeleianism is in order, and the distrust with which the ordinary man regards idealism is sound and just.

Fichte apparently dispenses not only with the material world but also with the Divine mind, and regards the universe as the free creation of the Ego. As the system develops, however, it becomes evident that Ego is only another name for Spirit, and that the mind of any particular man is but a small part of the Ego which creates the whole universe. The finite Ego is the same in its nature and life as the absolute Ego, but is less extensive. "All individuals are included in the one great unity of pure spirit."[1] This tendency to go beyond the finite Ego to an absolute Ego appears more distinctly in Schelling's early efforts to supplement and perfect the system of Fichte, but it is apparent in the works of Fichte himself. As with Berkeley, so with Fichte, the spiritual principle to which we are forced to refer the cosmic order is in large measure beyond the consciousness of the finite mind. Of one texture with the finite thinker, it is by no means a mere phenomenon to the human percipient.

It is an inadequate and unfair definition of idealism, then, which makes its essence consist in maintaining that the external world has *no* reality farther than that of being per-

[1] *Dignity of Man*, Eng. translation by Kroeger, p. 336.

ceived. Some kind of external reality must be admitted if we are to regard the universe as anything more than a disordered series of irrational mental states. Idealism differs from realism, not by denying the necessity of assuming for the explanation of perception a principle which transcends the individual mind, but by certain deeper criteria of which this is but an imperfect epistemological expression.

Equally unsatisfactory is the second criterion to be mentioned. Some men would consider any philosophy realism which holds that there are beings distinct from the mind, and that these beings act causally upon the mind to produce perception. On this view the realities might be of the same nature as the mind, so that all existence is spiritual; yet as a truly causal interaction is admitted, any individual must grant that his perceptions are caused by realities external to himself. The monadology of Leibniz becomes realism, then, as soon as we admit that the monads have windows.

Much evidence can be found in the writings of Fichte, Schelling, and other German idealists, to show that they regarded the explanation of perception by causality as being a criterion distinguishing realism from idealism. Fichte says "The true question in dispute between dogmatic realism and dogmatic idealism is, therefore, in what manner shall we explain representation? Through the conception of causality! asserts realism. Through the conception of substantiality! asserts idealism."[1] By substantiality Fichte means to indicate the view which regards the non-Ego as possessing no reality or efficiency except that which it receives from the Ego.

But a further examination shows that we cannot satisfactorily distinguish the two philosophical tendencies according as they do or do not explain perception by the causality of something external to the percipient mind. For in the first place, upon this basis even Berkeley, the high-priest of idealism, would figure as a realist. With Leibniz, also, al-

[1] Fichte, *Science of Knowledge*, Kroeger's translation, p. 133.

though our perceptions at any given moment arise by virtue of the spontaneity of the mind, they all trace back ultimately to the causality of God. In the second place, the real import of the change introduced by the post-Kantian idealism consists not in the fact that it has destroyed the conception of a causal relation obtaining between the individual mind and its environing universe, but rather in the fact that it has taken the causal conception up into the higher idea of an organic system. It is true that the relation in which one member of this system stands to another is a teleological one, by virtue of the membership of all individuals in the common plan; and the idealistic theory of knowledge is therefore concerned to show that the cognitive relation is not mechanical simply, but that subject and object mutually imply one another within the teleological unity of an organic whole. Could this be successfully denied, I judge that idealism would fail. It is necessary to show that the relation of the mind to its environing universe is not simply mechanical, barely causal, but that it is teleological. As soon, however, as we have taken the causal idea up into this higher thought of systematic relation, we can give it its relative truth. Subject and object, or rather sensation and stimulus, are in relations which are not *merely* causal, in the pluralistic or mechanical sense; it does not follow, however, that the causal judgment has no applicability to the situation. On the other hand, it may as fairly be applied there as in any other relation. But in any relation it gives only an abstract and superficial rendering of the true connection of individual facts within a universe. "The truth of mechanism is teleology."

According to the modified view of causality now under discussion, a cause does not act directly upon its effect, but the causal action is mediated through the world-ground. It is by virtue of the immanence of the world-ground in the object, and by its free activity, rather than by the direct transeunt action of the mechanical cause, that an orderly effect issues.

Perceptions arise in the mind, then, not by the direct causal action of objects, but by the ideal immanence in the mind of the world-ground as absolute Ego. But as this is what all causal action really implies, we are as well justified in saying that our perceptions are caused by something other than the mind as in saying that physical changes are caused by other physical changes. The refusal of German idealism to explain perception by means of causality, then, amounts to no more than an assertion that all such causal action must take place within the jurisdiction of one all-comprehending world-ground and must be guided and controlled at every turn by the spontaneity of this absolute Spirit.

Having rejected as unsatisfactory criteria of idealism both the denial of an external world and the denial of a causal relation between the finite mind and the universe, it is necessary to go deeper in order to discover its essential marks.

Idealism can best be characterized, I think, by subordinating the purely epistemological standpoint to the metaphysical one. Dropping for the moment the question of the origin of perceptions, we should ask what sort of a world-principle idealism contemplates. The essential divergence from realism, and the grounds for the epistemological theses will then appear in their proper correlation.

Idealism is convinced, in the first place, that the world is the production of a unitary principle; a principle, moreover, which in a systematic and orderly way bears upon its bosom a vast multiplicity of detail. This idea of systematic unity finds its best analogical expression in the conception of an organism. The world is an organic unity, in such wise that the ideal of the whole is immanent in every part. It is true that the analogy of an organism, if taken with utmost strictness, must after a time break down, but it serves to illustrate in some degree the relation which individuals can bear towards an ideal system-founding universal. It is only when we study the deeper implications of the mind-life that we find this relation-

ship displayed in a way which is more than analogical and which does not break down when applied to the Real. The world is a system-bearing unity, then, to which the deeper relations found in the mind-life furnish the key. This monistic bent is both logically and historically involved in idealism as a philosophical tendency. A pluralism which admits no higher unity within the sphere of a Being which is truly one cannot claim to be an idealism. Against such a view we find the idealist arguing that absolutely discrete entities cannot interact, and that therefore no universe can be formed by pluralism. And since they cannot interact, they cannot act causally upon the mind. It follows that even if a multitude of discrete elements existed we could not know it.

The philosophy of Leibniz illustrates the significance of the conception of an immanent totalizing ideal to which the activities of the world forces and the orderliness of nature are referred. For Leibniz, the possibility of interaction between monads depended upon the creating and adjusting power of God. Only because God ordains that two monads shall act in unison do they exhibit the relations which we refer to interaction. In fact, however, no dynamical relations exist between the two. Leibniz holds, it is true, that the apparent interaction has been preestablished for all time, and that the further mediation of God is no longer necessary in the sense in which it was required at the beginning. This point, however, is not essential to the present reflection. The important consideration is that the monads, regarded as independent entities, cannot influence one another, and the possibility of forming them into a universe depends upon the all-including monad, God. The philosophy of Leibniz is therefore, so far as this criterion goes, a true idealism. But the preestablishment at the creation of all causal events proved too vigorous a doctrine for his successors. Accordingly, they admitted a truly dynamical interaction between the monads, an influence not mediated by Divine assistance. God became, then, a

necessity of thought, an *Ens rationis*, even an *Ens realissimum*, but no longer a concrete postulate to make possible physical change. Banished into the region of abstractions, with the world progressing successfully without him, the very existence of God came into serious question. Thus the transition was made from the idealism of Leibniz to the dogmatic realism which preceded Kant, merely by denying that interaction is mediated by the ideal influence of a monistic world-principle.

The same presupposition is essential to the argument of Fichte and Schelling. The explanation of perception by external causation they hold to be impossible. One could admit that the problem of knowledge cannot be solved by reducing cognition to a result of physical stimulation, but it is not so clear that *no* determinations of perception can be due to the way in which real things might act upon us. Upon careful search, however, we find the explanation of their thought in the repeated recurrence of passages like the following: "But further, these two activities [of the subject and of the object] cannot be absolutely opposed to one another, unless they are activities of *one and the same identical subject*. They cannot therefore be united in one and the same product, without a third which is the synthesis of the two."[1] The possibility of bringing together the finite Ego and the non-Ego, and of allowing them to mutually determine one another, rests upon the fact that the two are united within the absolute Ego. And in fact this is nothing more or less than the central doctrine of Kant's Critique of Pure Reason, that all science rests upon synthesis and all synthesis is within the transcendental unity of the constitutive category. All post-Kantian idealism, then, is foreordained to monism. A similar effect is produced in the Greek idealism by the Platonic doctrine of the concept. Berkeleianism is less developed in this respect, and has not thought out deeply the relations in which the individual mind stands to the world-ground. It has therefore failed to catch

[1] Schelling, *Sämmtliche Werke*, Abth. I, Bd. III, S. 440.

the genuine logic of constructive idealism. Its argument for the mutual correlation of subject and object has put it upon a course, however, which justifies us in classifying it as idealism, although crude and undeveloped.

Upon the criterion here defended all forms of pluralism, however much they may insist that their plural elements are souls, must be classed as realism. Herbartian metaphysics accepts this designation. Lotze's extension of the Herbartian realism consists in adding to it the very feature which characterizes idealism, and is therefore a radical alteration.

All idealism is monistic, inspired by the conception of a system-founding whole ideally immanent in the parts. It is not practicable to say, of course, that all monism is idealistic, although it may very well be that all consistently thought out monism which attempts to define the conception of a concrete or system-founding universal will be so. It is therefore necessary, in order to secure a completed definition, to develop the further characteristics of idealism.

Its second important characteristic consists in the fact that for idealism all knowledge, and indeed all forms of apprehension of the Real, rest upon and presuppose idealization. That is, they rest upon the operation within the finite consciousness of the ideal of the Universal, the Totality, bringing out the orderliness which is implied within experience. The content of this ideal is not derived by copying from finite sense feeling, but rests upon the autonomy of Mind itself.

It is unnecessary to point out how this element, first introduced into philosophy in articulate form by Plato, has played a prominent part in all constructive idealism. Many forms in which the doctrine has been cast have been defective. Idealism does not need to hold to an *a priori* rational knowledge apart from experience; it does need to hold, so far as I can see, to the domination of an ideal universal in knowledge. Its theory of knowledge, then, can only be a theory of the way in which experience implies and exhibits the operation of this dominant universal.

It is more important to point out the connection of this epistemological criterion with the metaphysical one first mentioned. The epistemological doctrine is rendered necessary, if the metaphysical one is to be maintained, because only through the idealism of finite consciousness can any knowledge be gained of a totalizing synthetic Universal, or any meaning be given to the conception. If all cognitive experience testified only of contingent phenomena, of physical facts in time and space, then there would be no evidence of an intelligible unity in the world. Indeed, we should then be forced to say that any unity which might exist in the world must be unintelligible. But if knowledge involves the treatment of perceptual experience in the light of an ideal of unity and order transcending perception, then all cognitive experience testifies to the existence of spiritual order in the world. Every experience we have, every fact that we know, is so much experiental testimony of mind in the world. Unless we knew God we should not knowing anything. In brief, a dominant universal in the world carries with it a universal operative in knowledge; and the establishment of the universal operative in knowledge is the ground, and the only rational ground, for asserting the dominant universal in the world.

This criterion has an adverse bearing upon any idealism founded upon sensationalism. The essential thing about sensationalism is its conception of thinking as copying sense data. The resulting denial of idealization in knowledge precludes the possibility of a perfected idealistic system on this basis, and drove Berkeley in his later years to Platonism.

The third characteristic mark of idealism is its conviction that the ultimate import of the ideal operating in the finite consciousness is Reality itself. *The ideal is the real*, if you first define the ideal with sufficient breadth and depth. The perfect fruition of that intellectual and ethical idealization which autonomously reveals itself in the life of mind gives us our only intelligible interpretation of the category of Being

or Reality. Throughout all our intellectual life we are judging some interpretations of experience to be relatively illogical and false, others to be relatively logical and true; and the basis or postulate of this procedure can only be our implicit recognition that Reality must be a coherent whole, such as would be presented in a perfectly organized and totalized experience. By the very meaning of the category, then, Reality is the norm of the mind. This conception of the ontological predicate we are in fact using all the time, and we have no other conception of it which can be analyzed, defined, or freed from contradiction and absurdity. In particular, the meaning of the ontological predicate cannot be found in the sense of pressure or resistance. It is upon this point that the idealistic polemic against mere causality becomes in order.

It is clear that this third thesis also is logically bound up with the fundamental view-point and tendency of idealism. We have said that reality is an organic or mind-like unity: that we know it to be so, because in every act of knowledge we are led by an organizing ideal. We require to add that this ideal presents the real; otherwise our argument fails.

Under this third criterion the philosophy of Leibniz falls somewhat short of a genuine idealism. It infers from the individual monad to the nature of other monads by *analogy*, rather than by the recognition of identity of principle. It does not say, Reality is known as the perfected Principle revealed in the idealism of my individual life. It says, Reality is known as *like* my individual will. It is true that the organic relation of part to whole, upon which the system of Leibniz turns, implies a deeper thought; but so far as thinkers who follow him fall back upon the analogical inference from the individual to the transcendent they tend to lose this deeper thought.

The three criteria here developed were satisfied by Greek thought, and by those philosophical developments through the ages which have drawn most inspiration from Plato. It is only in the speculation which followed Kant, however, that we

can find in modern times a satisfactory and relatively independent development of idealism. It is only in post-Kantian speculation, and especially in the systems of Schelling and Hegel that the task of constructing a philosophy of natural science upon idealistic lines is fairly attacked. The success attained in this field has not generally gained a high rating. Subsequent thought has made some advance beyond them, but the present state of idealistic Naturphilosophie is not a matter of congratulation. The entire course of thought in this field has been largely determined by Schelling, and it is chiefly to his work, especially so far as it concerns speculative physics, that this monograph is devoted.

CHAPTER I.

KANT'S METAPHYSIC OF NATURE.

A. *Its Significance for Idealistic Speculative Physics.*

A discussion of the problem which idealism has to treat in the philosophy of physics must take into consideration at the beginning the doctrines of Kant as set forth in his work on the *Metaphysical Basis of the Natural Sciences.* It is true that Kant himself is not a thoroughgoing and consistent idealist. For the metaphysic of nature, at any rate, the reality which lies at the basis of the material world is unknown. The Critical Philosophy is doubtless idealistic in spirit, yet it wants many of the characteristics which mark a genuine idealism. It may seem irrelevant, then, to begin a study of idealistic Naturphilosophie with a discussion of Kant's Metaphysic of Nature.

The reasons which render such a course advisable, however, are cogent. Kant and his idealistic successors found themselves confronted by much the same task. For both the material world, as a world of independent, self-existent realities, had vanished. That which was absolutely real bore no resemblance to the matter which science conceived. The task arose, then, of explaining how the appearance of a material world subordinate to law should be maintained when nothing analogous to it in reality existed. For the performance of this task the differing materials supplied by the different systems of metaphysics would suggest different methods. Historically, however, the methods adopted were not radically different. The main features of Kant's *Metaphysical Basis of the Natural Sciences* were adopted with slight change into the *Naturphilosophie* of Schelling, and through this channel its

influence was transmitted to subsequent idealistic speculation on nature. The chief task of Schelling was, not to improve upon the Kantian doctrine, but to work out more clearly its connection with idealistic philosophy. Much was added by Schelling, of course, but the spirit of the whole was determined by Kant. For this reason an examination of the *Metaphysical Basis of the Natural Sciences* must form the beginning of a critical discussion of the subsequent speculative physics.

B. *Outline of the Metaphysic of Nature.*

The *Critique of Pure Reason* had shown that the world of experience is constituted for us by the synthetic activity of the transcendental unity of apperception, as it combines the manifold which is given through the forms of space and time. The material world, then, must depend entirely upon the application of the categories of the understanding to the manifold given through the form of the external sense, that is, in space. We are led to expect, therefore, that a metaphysic of nature should bring the phenomena of the external world into connection with the categories of the understanding, showing specifically what part each category plays in the construction of nature, and proving that on this hypothesis the material world would be constituted such as science knows it.

It is doubtful if this task is successfully accomplished. Kant does attempt, however, to bring the phenomena into connection with the categories of the understanding. This is accomplished by an artificial systematization of the mode of treatment. Matter is considered from four points of view, corresponding to the four classes of categories, quantity, quality, relation, and modality. Under each of these headings three distinctions are made, which are identified with the three categories of the corresponding class. Now, since the understanding leads all other predicates pertaining to the nature of matter back to the one predicate of motion, which

is the only one capable of affecting the senses, natural science is throughout a doctrine of motion. Therefore the first of the four divisions, phoronomy, treats of motion as a mere *quantum;* the second, dynamics, treats of it as an original moving force belonging to the *quality* of matter; the third, dynamics, deals with this quality as by its own reciprocal motion in *relation;* the fourth, phenomenology, considers matter with its motion as phenomenon of the external sense, or in reference to *modality.* In considering these it seems better to neglect Kant's order of treatment, and to deal at once with the second division, dynamics, which forms the core of the whole doctrine.

Matter, for dynamics, is the movable so far as it fills space. To fill space means to resist everything movable which endeavors to press into the space in question. This involves the capacity of offering resistance, a capacity which is related to the act as cause to effect. Now, what is this property upon which depends the capacity of matter to offer resistance? Some hold that it is the solidity of an existent substance, and that the very conception of such solidity carries with it that of resistance. This, however, is not the case. Only when there is attributed to that which occupies space a power of repelling that which approaches it does one comprehend how it involves a contradiction that one thing should penetrate into the space occupied by another. The penetration into space is a motion. It is diminished or destroyed by resistance. Nothing can diminish or destroy motion but another motion of the same movable in the opposite direction. This is proved in the phoronomy. Matter fills space, then, by causing another motion of the invading movable in the opposite direction. Now the cause of motion is a moving force. Not, therefore, by its mere existence, but by a special moving force, does matter occupy space.

Only two moving forces in matter can be conceived. That by means of which a body may be the cause of the approach of others to itself is *attractive* force; that by means of which

it may be the cause of repelling others from itself is *repulsive* force. This latter is a force of expansion, and it is by the repulsive force of all its parts that matter fills space. This repulsive force must have a definite degree, beyond which smaller or larger degrees can be conceived to infinity. As expansive force is elasticity, all matter is originally and essentially elastic. Now matter can be compressed to infinity, because a force able to overcome its expansion can always be conceived; but, however great the compressing force, it can never be penetrated, that is, the space of its extension can never be entirely abolished, since that would require an infinite compressing force, an impossibility. The expansive force here described increases in proportion to the degree of compression, and the impenetrability resulting may be called relative impenetrability resting upon the dynamical filling of space. The mathematical conception of impenetrability, according to which matter is really capable of no compression at all, would involve absolute impenetrability. The latter is nothing more than an occult quality. If we ask why one body cannot be penetrated by another, the only answer which this view gives is, because it was impenetrable. Repulsive force, however, does afford an explanation, since it gives a conception of an actual cause, in accordance with which the effect, resistance in space, may be accurately estimated.

The infinite divisibility of matter has long been disputed. What, on the dynamical theory, does it mean to say that matter is divisible? Matter, that which is for itself movable in space, is substance. That is, it is the subject of all that in space which can be counted as belonging to the existence of things. Now, to decide the question of the infinite divisibility of matter, we have only to remember that matter is that which *fills* space and that space is mathematically divisible to infinity. If it were not true that matter by its expansive force completely fills space, that no parts of space are vacant, the demonstration of the infinite divisibility of space would by

no means establish the infinite divisibility of matter. In a space filled with matter, however, every part contains repulsive force, able to drive back and move to a distance other forces. Hence every part of space filled with matter is movable in itself, and consequently separable from those remaining, as material substance, by physical division. Therefore matter, like the space it fills, is infinitely divisible.

This conclusion seems to be at issue with the proof, given in the discussion of the second antinomy of pure reason, that every substance in the world must consist of simple parts. We must remember, however, that the matter here spoken of is nothing by itself, and is real only in relation to perception. If we were compelled to assert that matter is infinitely divided, and consists in itself of an infinite number of parts, we should be in difficulty. What we said was that matter is infinitely divisible. Divisibility, however, is not the same as dividedness. Since matter exists only for perception, the division of matter goes only so far as we have actually carried it.

Now it is by virtue of a repulsive force that matter fills space and possesses elasticity and impenetrability. This force alone, however, is not sufficient to constitute matter. A purely repulsive force cannot limit itself, nor can it be limited by space alone. By repulsive force merely, then, matter could be held within no bounds, but would dissipate itself to infinity. Another force is required, original in matter, and working in the opposite direction to the repulsive force. That is, the possibility of matter requires the assumption of a force of attraction as its second essential fundamental force. Attraction alone could never render matter possible. By its action the distances between the parts of matter would be lessened to zero; that is, matter would vanish in a mathematical point. Thus the two forces of attraction and repulsion must equally be assumed. They are not, however, of equal rank. Repulsive force is a property contained in the

conception of matter, the ground of impenetrability. Attractive force does not belong to matter by conception, but is attributed by inference. The reason for this distinction is that the conception of matter involves the filling of space. Now that by virtue of which matter fills space is its repulsive force. The action of attractive force, on the contrary, is to annihilate matter by preventing the filling of space. The forces of attraction and repulsion differ not only in the direction, but also in the method of their action. Repulsion acts only by physical contact, attraction only at a distance. Physical contact implies not only mathematical contact, but something more. It implies a dynamical relation of the repulsive forces of the two bodies. It is the reciprocal action of repulsive forces in the common boundary of the two matters. The action of the attractive force essential to all matter, on the other hand, is never by contact, but is an immediate effect upon other matter through empty space.

It may be urged against the idea of action at a distance that a body cannot act where it is not. Kant replies that everything in space acts upon another thing in space where the acting thing is not. Merely by acting where it is a body cannot move another, since the other body is necessarily outside it. To deny the possibility of action at a distance is to assert that bodies can immediately affect one another only by the intervention of the forces of impenetrability. This means either that repulsive forces are the only ones by means of which matter becomes operative, or at least that they are the necessary condition of such operation. Both assertions, however, are without foundation.

We may further describe repulsive and attractive forces as superficial and penetrative respectively. Repulsive force cannot move any distant part except by means of parts lying between. It is merely a superficial force. Attractive force, on the other hand, extends itself directly through the universe to infinity. The degree of attraction is indeed diminished by

extent of space, so that it is in inverse proportion to the square of the distance, but it is never reduced to zero. The effect of this universal attraction is gravitation, and the effort to move in the direction of the greater gravitation is weight. The effect of the repulsive force is elasticity. Elasticity and weight, then, are the only universal characteristics of matter that can be discovered *a priori.*

Now this entire doctrine of dynamics must be brought into connection with the categories of quality. These categories are those of reality, negation, and limitation. The *real* in space is its filling through the force of repulsion. The force of attraction is opposed to the space-filling power, and is therefore in respect to it *negative.* The determination of the degree of the filling of space results from the *limitation* of one force by the other. In analyzing matter into the result of the mutual limitation of these two forces, then, we have marked out the function of the categories of quality in a metaphysical dynamic.

The metaphysics of motion must next be considered. In the first place let us look upon matter in its simplest aspect, as that which is capable of motion in space. In thus treating of matter under the categories of quality merely, we abstract from the causal connection of bodies and even from mass, and deal only with motion and its quantity. The task of phoronomy is to construct the quantitative relations of motion as determined in velocity and direction, and especially in the composition of motion.

Matter is the movable in space. Space, however, may be considered from two points of view. Space which is movable is relative, that in which all motion must finally be conceived is absolute. Absolute space is not a space-in-itself, it is simply indeterminate space in general, within which every relative space can be assumed as moved. Now all motion which is perceptible is merely relative, and presupposes a larger relative space in which the smaller space is moved. Motion is

merely the change of the external relations of a thing to a given space. This definition makes clear the relativity of motion. It is indifferent whether we say that a body moves in one direction in a resting space, or that space moves in an opposite direction while the body remains at rest.

The problem of the composition of motion is the real one of phoronomy. In constructing this conception one presents *a priori* in intuition a motion, so far as it arises from two or more given motions united in one movable. Now, in accordance with the principle of the relativity of motion, the composition of two motions of the same movable can be presented only if one of them is presented in absolute space, while instead of the other, an equivalent motion of the relative space in the contrary direction is presented. There are three cases of the composition of motion, corresponding to the three categories of quantity. The first, where two motions in the same direction and on the same line are compounded, involves *unity* of line and direction. The second, in which the motions take place along the same line in opposite directions, gives *plurality* of direction in the same line. In the third case two motions in different directions along lines forming an angle are compounded into a motion along a line different from either of the others. This involves *totality* of lines and directions.

So far we have considered motion in abstraction from the actual moving forces involved. We may now go on to metaphysical mechanics, which takes account of the quantity of matter and of motion, and of the relations of the moving forces of matter. In form, this brings the conception of matter under the categories of relation. The quantity of matter is the sum of the parts of a body which are movable in a given space. When these parts act together, they constitute a mass. The quantity of motion, for mechanics, is the product of the quantity of matter multiplied by its velocity. Now the only measure of the comparative quantity of matter contained in two bodies is the comparative quantity of motion which the two exhibit.

We are now ready to lay down the three fundamental laws of mechanics. The first asserts that in all physical changes the quantity of matter remains the same. It has been shown in the *Critique of Pure Reason* that no substance can arise or be annihilated, and here we need only point out what constitutes substance in matter. Now the movable in space is the ultimate subject of all the attributes of matter. The sum of its parts, therefore, is the quantity of material substance. Hence the increase or diminution of the quantity of matter would mean the creation or annihilation of substance, and is therefore impossible.

The second law of mechanics is that every change of matter has an external cause. General metaphysics proves that every change has a cause, and it only remains to show that the cause of material change must be external. Matter, however, is the object of the external sense, and therefore is subject to no determinations except those of external relation in space. Since, then, matter has no internal determinations, all change of matter is based upon external causes.

In like manner the third law of mechanics depends upon universal metaphysics. All external action is shown by metaphysics to be reciprocal action. The third law is that action and reaction are equal. It needs to be proved, then, that for mechanics reciprocal action is reaction. Kant proves this by the relativity of motion in space. It is indifferent whether we say that one body moves towards a second in space, or that the second together with its space moves towards the first. If the bodies come in contact, then, the impact of one will involve an equal opposed impact on the part of the other.

These three laws, of permanence, inertia, and reaction, exactly correspond to the categories of substance, causality, and community, the three categories of relation.

The sphere of the categories of modality has not yet been explained. This is done in the phenomenology, in which matter is considered as an object of possible experience. The

rectilinear motion of a body is a merely *possible* predicate. This is true because motion is relative and the moving body may with equal truth be regarded as resting, if we look upon its surrounding space as moving in the opposite direction. Absolute motion is impossible. Circular motion, however, involves a constant play of new forces such as rectilinear motion does not, and must therefore be admitted as a *real* predicate of matter. Again, if one body is moving in comparison with another, an equal opposite motion of the latter is *necessary*.

Metaphysics can do no more than this, either in grounding a general theory of matter, or in explaining the basis of physical science. The further determinations and behavior of matter must be traced out by empirical research.

C. *Critical Analysis.*

The general favor with which the theory of matter set forth in the Metaphysic of Nature has been received by idealists indicates that it can be readily assimilated to the thought of an idealistic philosophy. It is actually found, however, in connection with a system far removed from thorough-going idealism. The presumption would arise that it logically belongs in Kantian moorings, and that its appropriation by later speculators was not rationally justified. If this doctrine issues from the phenomenalism of the Critique, how can it be preserved and even amplified by thinkers who hold that perfect science reveals reality?

But is the presumption well grounded? Does Kant's Metaphysic of Nature results from the *Critique of Pure Reason?* Is it even consistent with the Critique?

This discussion, then, does not at present concern the tenability and value of the views set forth in the Metaphysic of Nature. Let it be as valuable as Kant supposed. In the first preface of the Critique he says that he hopes to produce a system of pure speculative reason under the title of Metaphysic of Nature. "It will not be half so large, yet in-

finitely richer than this *Critique of Pure Reason.*" Accepting provisionally this evaluation, the question arises, Is it Kantian?

Let us deal first with the favorable presumption which is established by the apparent deduction of this speculative philosophy of nature from the *Critique of Pure Reason.* In the preface referred to, Kant speaks of this work as the carrying out to completeness of the doctrines of the Critique, "a completeness rendered not only possible, but necessary, through the perfect unity of this kind of knowledge all derived from pure concepts, without any influence from experience, or from special intuitions leading to a definite kind of experience, that might serve to enlarge and increase it." [1] Within the work itself he repeatedly speaks in such a manner as to imply that he is merely applying the principles of metaphysics, and that no characteristic of matter which is not knowable *a priori* falls within the compass of the investigation. Thus, in the preface we find him saying, "It may serve as a second ground for gauging this procedure that in all that is called metaphysics the *absolute completeness* of the sciences may be hoped for, in such a manner as can be promised by no other species of knowledge, and therefore, just as in the Metaphysic of Nature generally, so here also the completeness of corporeal nature may be confidently expected; the reason being that in metaphysics the object is considered merely according to the universal laws of thought, but in other sciences as it must be presented according to the data of perception (empirical as well as pure). * * * This metaphysical corporeal doctrine I believe myself to have completely exhausted, so far as it reaches, but do not affect thereby to have achieved any great work."[2]

Kant, then, wished to have the Metaphysic of Nature regarded as deduced *a priori* from his philosophy. That it is

[1] Kant, *Critique of Pure Reason*, Max Muller's translation, vol. II, p. xxix.

[2] Kant, *Werke*, ed. Rosenkranz, vol. V, p. 313.

accepted in this light, the following quotation from Professor Watson will show: "Kant, however, has a special treatise in which he sets forth the metaphysical principles of the science of nature, showing how intelligence, as operating upon the manifold of sense, gives rise to the world of matter. * * * The Metaphysic of Nature, then, contains those principles which are the product of the schematized categories as applied to a definite manifold of sense, the material world. * * * It is practically the concrete for the abstract of the Critique." [1]

Kant reinforces this opinion by his obvious attempt to bring the teaching of the smaller work into connection with the categories of the understanding. The table of categories seems to determine the form and treatment of the entire discussion. The division of the work corresponds with the classes of categories, and within each division it is pointed out that the entire teaching of that division is in reality nothing but the marking out of the function of the three categories involved. The form of the work itself, then, indicates the closest possible dependence upon the Critique.

In fact, however, the fundamental doctrine of the Metaphysic of Nature is by no means dependent upon the *Critique of Pure Reason*. It was reached independently of the Critique, and before Kant even dreamed of the Copernican revolution in philosophy. It was reached from the standpoint of a philosophy the overthrow of which was one of the purposes of the Critique. It disregards some of the most central teachings of the Critique, and is flatly contradictory towards others.

The most important portion of the Metaphysic of Nature is unquestionably the second part, dynamics, which explains matter as the product of the opposite forces of attraction and repulsion. Now the date of this work [1786], five years after the first edition of the *Critique of Pure Reason*, one year before the second edition, and three years after the *Prolegomena*,

[1] Watson, *Kant and his English Critics*, p. 237.

gives reason to believe that the views which it contains are fully in harmony with the speculations of the critical period. Bax says, "Written in 1786, just one year before the publication of the second edition of the Critique, it belongs to the maturest period of Kant's philosophical activity." If we take account of the earlier works of Kant, however, the presumption that the principles of the Critical Philosophy guided in working out the Metaphysic of Nature is greatly shaken.

In this connection the most important is the *Monadologia Physica*, written in 1756. This work rests in general upon the post-Leibnitzian metaphysics. Starting from the doctrine that bodies consist of monads, simple substances which can exist in isolation one from another, the first part is devoted to a demonstration that the existence of physical monads is consistent with geometry. The second part explains further the most general characteristics of physical monads, and how they contribute to the understanding of the nature of bodies. In the first part Kant urges [Prop. VI] that a monad marks off the small space of its presence not through a plurality of real parts, but through the circle of its activities by which it restrains the monads everywhere present without it from approaching closer to itself. One is to look for the ground of the filling of space, he says, not in the mere existence of the substance, but in an activity which the monad exerts outwardly in all directions. This view is identical with the one supported in the dynamics, and is supported by the same arguments. Here, however, it is explicit that the monad is simple and indivisible, while in the dynamics the parts of matter are supposed to be at least capable of farther division.

In Prop. VIII Kant shows that the force by which a body fills space is the force which results in impenetrability. Elasticity is also explained from this same force, in the same way as in the later work. The force of expansion has a definite degree, which may always be exceeded by other forces. Since, however, by compression the repulsive force becomes stronger,

it is clear that by no conceivable force can the element be thoroughly penetrated. The *Metaphysical Basis of the Natural Sciences* adds nothing to this handling of impenetrability and elasticity.

Prop. X of the *Monadologia Physica* shows that repulsive force alone cannot constitute matter, since by repulsion matter would be held to no definite bounds, but would dissipate itself to infinity. An equally original attractive force must therefore be assumed. Kant then develops the relations of these two opposed forces, and the physical conceptions grounded by each, in a manner precisely similar to that which he employed later when writing the dynamics.

The divisibility of matter, however, is treated somewhat differently in the two works. The *Monadologia Physica* opposes the infinite divisibility of matter, holding that matter consists of simple parts, that is, of monads. The later work maintains that matter is infinitely divisible, but not infinitely divided. In this respect the influence of the Critique is apparent.

In the first division of the Metaphysic of Nature, the phoronomy, the composition of motion, is explained by means of the relativity of motion. It would perhaps seem that Kant in maintaining this position was influenced by the results of the Transcendental Aesthetic. If space as known is simply a relational form, and in no wise a thing-in-itself, the doctrine of relativity would seem to issue. Certainly Kant makes large use of this idea. It is developed in the phoronomy, and there applied to the composition of motion. In the mechanics it is again brought in to explain the necessity of equality in action and reaction. Again, the whole of the fourth division rests upon the relativity of motion. Now in the *Monadologia Physica* nothing is found of this principle. Two years later, however, in 1758, Kant published an essay entitled *A New Doctrine of Motion and Rest.* In this he developed very fully the idea that all motion of a body in space may with equal

propriety be regarded as the motion of a relative space while the body really rests. Motion and rest, he urges, are terms which can never be used in an absolute sense, but only in a relative one. This is the same doctrine of motion as occurs in the Metaphysic of Nature. In the latter work, however, the conception of rest is more fully developed. Rest, it is urged, is to be conceived, not as a lack of motion, but rather as lasting presence in the same place, in one set of relations. If it is so conceived, we may hold that the body called at rest is really in motion with an infinitely small velocity. The advantage to be derived from such a conception is that it falls into line with the principle of continuity, and enables us to pass gradually from motion to rest. Mathematical analogies strongly motivate this conception. It had not been fully reached and stated at the time of the essay on *Motion and Rest,* but the arguments which go to develop it are already there. Kant urges that if the law of continuity is to hold, and if rest is defined as the absence of motion, one body can never take effect upon another, for the reason that the beginning of motion, involving as it does a definite velocity suddenly added to the body, would break the law of continuity. This difficulty, which Kant later solves by defining rest as permanent presence in the same place, involving infinitesimal motion, he avoids in the essay by casting some reflections on the law of continuity. The theory of rest, then, advanced in 1758, is not quite the same as that propounded in 1785. In the former discussion, however, Kant had already arrived at the dilemma, the solution of which resulted in the later doctrine. It is clear, then, that the doctrine of rest, as stated in the Metaphysic of Nature, was reached independently of the Critical Philosophy.

I have shown that the doctrine of the relativity of motion as worked out in the phoronomy had been elaborated by Kant twenty-eight years before. The most important use which he makes of this doctrine is to aid him in deriving *a priori* the

law of mechanics that action and reaction are equal. It is in the attempted proof of this law that the third division of the Metaphysic of Nature, the mechanics, makes its only important addition to the Analogies of Experience in the *Critique of Pure Reason*. Borrowing from general metaphysics the statement that all external action is reciprocal action, the Metaphysics of Nature has to prove only that this reciprocal action is reaction—equal and opposed. The proof rests solely upon the relativity of motion. Now, in the essay on Motion and Rest this same proof is worked out as one of the consequences of the theory published in 1758. The *a priori* deduction of the third law of mechanics, then, was gained not from the standpoint of the Critical Philosophy, but some quarter of a century before the critical period.

The fourth division of the Metaphysic of Nature, the phenomenology, rests almost entirely upon the relativity of motion. It makes one addition, by way of correction, to the view hitherto expounded. Circular motion, it asserts, is to be looked upon not merely as relative, but as real. The reason for so regarding it is that circular motion involves a constant play of forces in order to change the direction, such as rectilinear motion does not. It is not apparent at what time this amendment of his favorite theory of the relativity of motion first occurred to Kant. Clearly, however, it has no logical connection with the Critique. The reason for asserting that circular motion is real is a purely physical one. Kant is in fact indorsing a well-known argument of Newton. The two remaining propositions of the phenomenology are mere repetitions of Kant's theory of motion, and contain nothing new. They are added here only to fill out his systematic scheme. Indeed, there is no other reason for the existence of the entire fourth division, the phenomenology—a fact pointed out by Kirchmann and Adickes.[1] It contains nothing new, and nothing of value from the standpoint of the Critical Philosophy.

[1] Adickes, *Kant's Systematik*, p. 130.

Let us now briefly summarize the results of our examination of the *Metaphysical Basis of the Natural Sciences.* Nearly the whole of this work has been shown to be a restatement without essential change of positions reached decades before the critical period. The contents of the phoronomy, which deals with motion, rest, and the composition of motions, were stated in 1758 in a form which, if somewhat less developed, was in essentials the same. There is nothing in this division which results from the Critique; and if we except the allusion to the categories with which the section ends, no effort to bring its doctrines into harmony with the Critique. The dynamics develops the idea of matter as the product of two forces. This entire doctrine is a restatement without marked change of doctrines expressed in the *Monadologia Physica.* It contains, however, a discussion of the infinite divisibility of matter which is due in part to the Critique and opposed to the teaching of the earlier work. The mechanics is related more closely to the Critique than are any of the other divisions. At the same time, it contains nothing really Kantian. It assumes the validity of the proofs of the analogies of experience, given in the Critique. To deduce the laws of motion becomes then an easy matter; the work had really been done in the Critique. The proof of the third law, however, required some additional effort, and here Kant availed himself of a demonstration worked out in 1758. The phenomenology, as has already been remarked, contains nothing of importance.

The wholly artificial character of the reference of these principles to the categories of the understanding is throughout clearly apparent. We have only to remember what the categories really are. They are functions of the understanding operative in constructing and determining individual objects. They issue in the predicates which the understanding applies to things. In order to know a single object fully we have to recognize its predicates under each of the several categories which determine its objectivity. The categories are

active, then, not merely in the objective world as a whole, but in every object of that world, and several categories are applied to each object. Now the applications of them which Kant here makes are often absurd. The categories of modality seem to have exhausted their usefulness in the apprehension of nature when they have informed us that one kind of motion is possible, another real, and a third necessary. Unity, plurality, and totality busy themselves with the task of informing us that if two bodies move along the same line in the same direction unity is involved, if in opposite directions plurality, while if on different lines totality of lines and directions can be predicated.

It is obvious that the work which the categories really perform, according to a Kantian theory of knowledge, is not that for which he is here using them. The application which he is here making of the table of the categories is only another manifestation of his well-known desire to systematize. Dr. Adickes, in his study on *Kant's Systematik*, has made an analysis of the present work from this standpoint. In it he lops off a large number of captions which were added by Kant for no other reason than to fill out his scheme. The phoronomy, which we treated after the dynamics, was placed first by Kant for this reason. It really contains, as Adickes points out, nothing but the doctrine of motion and rest, and of compound motion. It has nothing to do with unity, plurality, or totality. Concerning the dynamics, Adickes says "It is completely arbitrary when he brings the forces of attraction and repulsion into connection with the categories of reality and negation." [1] Besides, this does not contain the whole of the dynamics, as it takes no account of the doctrine of the divisibility of matter, the only constituent derived from the Critique. Concerning the fourth division, the phenomenology, Adickes justly holds that it is added solely for the sake of the scheme. Although it purports to consider matter "merely in

[1] Adickes, *Kant's Systematik*, p. 126.

relation to the mode of presentation, or modality, and therefore as a phenomenon of the outer sense," matter has already been regarded as a phenomenon of the outer sense.

"Let us eliminate," says Adickes, "what was taken in only on account of the system; that is, from the mechanics the first and second mechanical laws, from the phenomenology the first and third propositions. As the most important contents we then have left:

"First division: Doctrine of motion and rest and especially of compound motions.

"Second division: Doctrine of the essence of matter (original forces and divisibility).

"Third division: Doctrine of the estimation of the quantity of matter, of the equality of action and reaction.

"Fourth division: Doctrine of circular motion."

This analysis seems to me well judged. If we now eliminate also what is precritical and what has no reference to the Critique we lose all that remains of the first division, since it was contained in the earlier essay on *Motion and Rest;* we lose the second division with the exception of the discussion of divisibility; we lose the third division, since the estimation of matter is discussed without reference to the Critique, and the equality of action and reaction is proved as it was twenty-seven years before; and we lose the fourth division, since the sop to Copernican astronomy contained in the doctrine of circular motion has no reference to transcendantal philosophy. Sum total—the only important respect in which the Metaphysic of Nature applies the ideas of Kantian philosophy is in maintaining the infinite divisibility of matter.

These historical considerations doubtless serve to remove the presumption that the *Metaphysical Basis of the Natural Sciences* is an application of transcendentalism to physical discussion. At the same time, since it was written after the Critical philosophy had taken form, one might expect it to be sufficiently in harmony with Kantian principles to merit its place within his system.

But not even that is true. The difficulty of applying the theory of nature there found to the Kantian view of the world is apparent at all points. The Metaphysic of Nature presupposes space as existing independently of the percipient mind. As soon as we introduce the doctrine of the subjectivity of space, the conceptions of attractive and repulsive forces lose the meaning which they formerly possessed. A new meaning might possibly be read into them—to do so, in fact, was the work of later reflection by Fichte and Schelling; but it would constitute a new doctrine which would supplant the old. Hegel has shown that Kant does not make clear what are these forces by means of which space is filled. They are not brought into relation with the knowing mind, but appear to belong to a nature which exists independently of the mind. No attempt is made to show that the dualism implied in such a view is to be revised in favor of any form of monism. In fact the view offered by Kant goes more readily with what he calls dogmatic realism than with his own philosophy. This is due, of course, to the fact that it was originally developed from the standpoint of the Wolffian system, before Kant's historic arousal by Hume had taken place. Lotze says concerning this work: "I lament, in the first place, the gap which separates the results of these speculations from those of the Critique of Pure Reason. The ideal nature of space which is asserted in the Critique is here left almost out of account; the construction of matter is attempted exclusively from the ordinary point of view, according to which there is a real extension, and there must be activities adapted to fill it. I lament no less what has previously been observed by Hegel, viz., that there should remain so much uncertainty as to the subject to which the activities thus manifesting themselves in space, and so constituting matter, are to be attributed."[1]

It is evident, then, that whatever richness there may be in the Kantian Metaphysic of Nature, it does not properly be-

[1] Lotze, *Metaphysic*, section 178.

long to Kantianism as a system. Grown in a soil of Wolffian realism its appropriation and logical development by idealism furnishes a problem for later thinkers of the transcendentalist movement.

CHAPTER II.

SCHELLING'S CONSTRUCTION OF MATTER.

A. *Transition to Schelling.*

The philosophical revolution which Kant had begun was carried to its legitimate completion by hands more resolute than his. Starting from the *Critique of Pure Reason* and the *Critique of Practical Reason*, Fichte united into a harmonious system these discordant elements of the Kantian philosophy, and cleared the whole of the last lingering traces of dogmatic realism. The general result of Kant's work had been to show that the world, so far as consciousness is concerned, is the product of the synthetic activity of thought. If any other principle than active Reason is admitted to exist, it can at any rate have no influence on the world we know. That which really maintains the world is the activity implied in thought, and since of this we can never say that it *is*, but only that it *acts*, it follows that the world with its permanence cannot be explained as the manifestation of an existent substance. The synthesis of Kant overthrows the identity of Spinoza.

But if the world is the creation of a monistic active principle, it remains to show how from mere activity can arise a subject and object in knowledge, morality and duty, the permanence of matter, and the laws of organic and inorganic Nature. Fichte devoted himself to the problems of knowledge and of ethics. With those branches of the philosophy of Kant which concern physical nature and organic life, however, he had nothing to do. He believed that a correct understanding of the process of knowledge demonstrated that the questions of natural science have no real philosophical interest. If nature is only the creation of thought, any constancies which

may be discovered in things prove nothing about the Absolute Spirit which could not already be shown by an examination of intelligence. For the purposes of philosophy, then, the science of nature can add nothing to the truth which has already been worked out by the science of knowledge.

This result, however, is a paradoxical one. The body of scientific knowledge is too vast and too definite to allow us to believe that it is without significance for speculation. It was this impressiveness of nature, with her numerous and vigorous sciences, that induced Schelling to undertake the task of working out the philosophical significance of the laws and phenomena of the objective world. From the speculative standpoint which Schelling at the time occupied such a task could not legitimately be proposed. He did not then clearly see, however, what he afterward so strenuously maintained, that the Fichtean philosophy could give no account of the meaning of nature. Believing that the Kantian theories of cognition and of volition had received their true elaboration at the hands of Fichte, Schelling was impressed with the necessity of handling in the same spirit the discussion of those subjects which are treated in the *Critique of Judgment* and the *Metaphysical Basis of the Natural Sciences.*

In his earlier works upon the Philosophy of Nature, then, the connection of the results there set forth with transcendental idealism was not clear. The attempt to explain more thoroughly this connection called to Schelling's attention the necessity of revising the metaphysical principles upon which he was relying. The manner in which this revision was gradually carried out, in the course of the publication of several important works, adds greatly to the difficulty of discussing Schelling. The difficulties are perhaps less annoying, in dealing with the fundamental principles of the *Naturphilosophie*, however, than in any other part of his system. Schelling's opinions were subjected to continual modification, and in the sphere of more detailed scientific explanation one theory was

often discarded for another. The basal principles of the Philosophy of Nature, however, were maintained throughout the several most important works with a fair degree of constancy, even though the metaphysical setting changed. Now it is the underlying principles which constitute the most valuable part of the Naturphilosophie. Neither by temperament nor by training was Schelling fitted for discussing the more detailed problems of science, but in lining out the essential principles of an idealistic philosophy of natural science his work has determined the drift of subsequent speculation and has a lasting significance.

Our study of Schelling does not undertake a systematic exposition. It rather aims to analyze in a critical manner the nature of the problem which he proposes, so far as it is related to fundamental physical ideas, and to evaluate the means which idealism furnishes for coherent and illuminating thinking of this type.

B. *The Metaphysical Point of Departure of the Philosophy of Nature.*

In his earlier years Schelling was in full accord with Fichte on all questions of metaphysics, and his writings are among the clearest and ablest expositions of the *Wissenschaftslehre*. Prior to the publication of the *Ideas Towards a Philosophy of Nature*, there is only one point upon which he had made a significant modification of the doctrines of the master. This modification, one may add, was not so much in the spirit of revision as of development. Fichte had started from the Ego, a principle by which he sought to unify absolute spirit and the finite spirit. The Ego is not with Fichte the Absolute, it is not God, nor yet is it merely the subjective consciousness of the knowing finite individual, but it is in a sense both.

Fichte had himself experienced difficulty, however, in keeping the two from falling apart. A large part of the difficulty

of the *Wissenschaftslehre* turns upon ambiguities arising from these two senses in which the word Ego is used. It is by the more explicit recognition and statement of the distinction between the Absolute Ego and the finite Ego that Schelling first manifests his tendency to break away from the subjectivism of his teacher, and to find in absolute spirit a firmer basis for the independence of nature than could readily be conceded by Fichte.

If we take, then, the standpoint of the Absolute Ego, the true standpoint for the deepest metaphysical view of reality, we are obliged to recognize that spirit is the only true existence in the world. The finite mind which cognizes the objective world is but one form of activity of the deeper lying and more universal spiritual principle. In the finite mind this principle comes to consciousness, as by its nature it must do, but it is independent of the finite mind. The same absolute spirit underlies all finite minds, and becomes conscious of itself in the self-consciousness of individuals. It underlies also, however, the objective world of which the individual mind takes cognizance. Since spirit is all that truly is, nature cannot be something opposed to spirit and independent of it. Nature may very well be independent of the mind of man, but it must be sustained and ever produced anew by the universal spiritual principle from which it derives its life and essence. But just as the knowing mind is such because in it the Absolute Ego has come to consciousness, so for Schelling the objective world is real and material because in it the Absolute Ego is not conscious of its activity. Universal Spirit produces the world of nature, but produces it blindly, without knowledge that it is producing a world. Because the Absolute Ego is not aware of its agency in producing and maintaining nature, when it comes to consciousness, in finite minds, it regards nature as something strange to it, something foreign, something entirely independent of mind. In other words, nature is real. This is the reason why the common sense of

mankind declares the objective world to be independent of mind. It is independent of any conscious mind, but not independent of the spiritual principle upon which the consciousness of that mind depends. It is upon this fact that the distinction between reality and ideality is founded. Viewed from the highest standpoint, the productivity active in nature is free, it is an activity of pure spirit, and therefore ideal. But it never comes to consciousness of itself. When it is cognized, it is the *object* of an intelligence, and is accordingly regarded as opposed to intelligence. It appears, then, no longer as free, but as subjected to laws of necessity, and devoid of mind. "From the impossibility of the consciousness of a free act arises the whole distinction between ideality and reality."[1] With Schelling, as with Fichte, activity is in the truest sense ideal; but if we mean by real that which seems independent of the mind of the subject, and to be governed by necessary laws giving no evidence of its ideal character, then the unconscious activity of spirit as it manifests itself in the objective world is real.

This conception of unconscious spirit, which attains with Schelling so great importance, had come down to him through Fichte from Kant. The *Critique of Pure Reason* teaches that if perceptions are to form one continuous consciousness, and so an experience at all, the synthesizing unity of apperception must seize upon the sense given elements and bind them together. The existence of relations in the content of consciousness presupposes that they have been construed into the manifold by thought. This synthetic activity of thought, then, is deeper than the ideas which it synthesizes, and is not fully in consciousness. The "I think" which must be capable of attending every idea in consciousness is evidence of the synthetic unity, but not the apperception itself. Kant recognizes in the activity of the mind several stages or kinds of synthesis. The data of sense must first be seized upon by appre-

[1] Fichte, *Science of Knowledge*, Eng. tr., p. 219.

hension. Then elements which would otherwise have gone must be reproduced, reintegrated. But all these thought relations, and the entire work of synthesis as shown in apprehension and reproduction, are purely subjective, and furnish no basis for the independence and orderliness of the objective world. It is the work of the productive imagination to supply this deficiency. By its mode of functioning the productive imagination gives the objective basis for the affinities of presentations, by means of which the subjective association first becomes impossible. It seems to be the stiffening agent by which the manifold of sense is hardened into a cosmos obedient to definite physical laws—a cosmos concerning which more can be predicted than is warranted by the table of the categories. It ought to be the ground of explanation for everything in experience not furnished by the categories of the understanding or the given manifold, and even for the diversities in these. This important sphere, of which it takes complete possession in later idealistic thought, is only hesitatingly conceded to it by Kant. The precise field which the productive imagination is to occupy is not clearly marked off by Kant, but its importance to his system in constructing the objectivity of the world is fully recognized. He describes it as a blind, unconscious faculty of the soul, a form of synthesis in which the elements of the idea are bound together as they have perhaps never before appeared in consciousness. It is the same activity, he says, which performs one activity as productive imagination, and another as synthetic unity of apperception. And since the syntheses of apprehension and of recognition are only special forms of the apperceptive synthesis, it follows that all these faculties which Kant has distinguished are but modes in which the one activity of spirit energizes.

It is from such a consideration of the origin of the principle of the unconscious that we best see its true character. It was introduced into philosophy, in the first place, not to explain

the causal action of external things upon our sensibility, but to explain the possibility of a rational experience. It is not therefore a substance, or any residuum or abstraction of objectivity. It is rather akin to will—a relationship that became apparent after Fichte had united the practical and speculative philosophy of Kant. Activity is then higher and more ultimate than existence and permanence. "The unconditioned cannot be sought in any individual *thing*, nor in anything of which one can say that it *is*. * * * Rather there is revealed in every object of nature a *principle* of being which does not itself exist." [1]

The further fortunes of this conception of an unconscious spiritual productivity showed that it had not reached its final form with Schelling. In itself it is not consonant with the spirit of idealism. Idealism must define the real as the perfection of that principle displayed in the idealism of consciousness. Consciousness, then, is necessarily inseparable from spirit, and an unconscious spiritual activity is wooden iron. But while we must conceive of Real Mind in terms of consciousness, it is evident that the rational motivation of the individual finite thinker is far from being entirely and clearly displayed within the finite consciousness. No doubt that fact indicates a reflection upon the finality, the self-sufficiency, the absolute reality of the finite individual, but this inference is not declined by idealism. The Principle of the System, which is the ground both of knowing and of being, is active in the individual's thought. The logical propulsion which results from this over-individual motivation is apparent even in perception, although perhaps more distinctly so in conception and inference. No scientific or philosophical mind, not even the most talented, can exhaustively state and realize the implication of those logical promptings of which he is incipiently conscious; to do so would bring to each individual the full consciousness of the rational cosmos. Yet

[1] Schelling, *Sämmtliche Werke*, Bd. III, S. 11.

those logical promptings are not simply subjective imaginings. They are intimations of universe system, and have their centre of gravity in the Real, the Systematic Universal. From the function which they perform in building the structure of science and of truth we are able to ascribe to them over-individual import. This import is implicated in our consciousness, is of the very texture of reason itself, and yet is not given in our consciousness. To us, then, it is an unconscious control of our thought and judgment; we cannot say that it indicates an agency which is unconscious in itself, or outside the purview of the Absolute.

The point of departure of the Philosophy of Nature from transcendental philosophy having been indicated, it remains to mention two other metaphysical principles which determined Schelling's treatment.

In the first place, that treatment must be frankly and consciously monistic, as natural science is not. Wherever separatist principles are set up in isolation from the other forces of nature, Schelling sees an antagonist. It is for this reason that vitalism receives his condemnation, even while its commonly recognized opponent, mechanism, does not win his support. It is this that makes him an evolutionist, regarding every new form of being as only a new gradation of the same process already revealed in other forms. It caused him also to regard all forms of physical force as varieties of one systematizing force, although the work of Joule and Helmholz had not yet rendered the thought an easy one to hold. Schelling's Philosophy of Nature must be monistic, then, because idealism is monistic; but it must enter into the details of nature and scientific theory, as ordinary philosophical monism has not felt itself compelled to do.

In the second place, the categories which exhibit more perfectly intrinsic membership of parts within a systematic whole must claim for Schelling a certain superior dignity and truth, as against those which do not. Accordingly,

teleological conceptions will dominate over mechanical ones, and conceptions of the organic world over those of the inorganic one. This necessarily follows from idealistic presuppositions, since the ideal is real, and the ideal, as determined through the idealism of consciousness, culminates in a universal synthesizing purpose, an organic unity. It is apparent in Schelling in his opposition to mechanical conceptions of matter, in his conception of nature as a universal organism, and in many minor turns of his thought.

Subject to the criticism already passed upon the conception of unconscious mental productivity, it would seem that the foundations of the Philosophy of Nature as here described are soundly laid. If a man is to be an idealistic thinker, he must address his thought to the problems of natural science under the guidance of the three principles here outlined; and it is only the fact that other writers have often blinked the problem which is entailed by a genuine and detailed synthesis of the sciences from this point of view that has enabled them to neglect the building of an idealistic *Naturphilosophie*.

C. *The Problem and Method of the Philosophy of Nature.*

The physical sciences deal with matter and force. For them matter cannot be created or destroyed. Even the particles in which it is present exist eternally. Moreover, it is in a certain sense inert. The possibility of a science of mechanics, and with it of physics generally, rests upon the principle that any change in the mode of behavior of a material body must be produced by an external cause. The magnitude of the effect produced will bear a definitely determinable relation to the power of the causes operating upon a body of known physical qualities. This is possible only if matter is capable of being regarded as inert, devoid of self-centered spontaneity.

But transcendental philosophy has declared that there is nothing in the world but spirit, and that spirit is never inert,

but is freely active. This conclusion of transcendental philosophy must be accepted by the Philosophy of Nature. "Nature must be viewed as the unconditioned. The idea of the existent as something original must be banished from the Philosophy of Nature, as from transcendental philosophy." [1] "For the science of nature, therefore, nature is originally only productivity and from this as its principle science must set out." [2]

This conception of nature harmonizes well with the principles of idealistic philosophy. But the facts of mechanics and chemistry do not obviously square with it. Perception seems to support the claim of scientific theory that nature is opposed to mind and totally unlike it. Philosophy asserts that in truth no such nature exists. The burden of proof, then, is upon the side of idealism. It must point out in detail how a principle which is through and through spirit may exert its activities in such a manner as to produce the appearance of a nature subject to the laws of mechanical necessity and quite devoid of the purposive spontaneity which is commonly ascribed to mind. The particular findings of science must be interpreted in such a way as to give them some significance for philosophy.

It is Schelling's great merit to have recognized fully the task which devolves upon idealism in the interpretation of Nature. That with which all philosophical speculation deals is nature as productivity, *natura naturans*. This, he urges, is nature as the unconditioned subject; it is the productive activity in its unlimitedness. In antithesis to this, however, arises nature as product, *natura naturata*. It is this with which all empirical knowledge deals. When we look upon the totality of objects as the sum of being, this totality is a mere product. It does not follow, however, that the product is totally distinct from the productivity. On

[1] Schelling, *Sämmtliche Werke*, Bd. III, S. 12.

[2] Ibid, S. 283.

the contrary, the productivity is working in and through the products. The ordinary empirical view, fixing its attention upon the complex of products, fails to recognize the productivity. The philosophical view, on the other hand, is concerned primarily with the productivity, and for it the product vanishes in the productivity. "We may indeed be quite certain that every natural phenomenon, through whatever number of intermediate links, stands in connection with the ultimate conditions of a nature; the intermediate links themselves, however, may be unknown to us, and still lying hidden in the depths of nature."[1] But still the facts remain, and are not to be lost sight of by a speculative theory of nature. Their connection with that higher principle must then be pointed out. The task which confronts idealistic philosophy, then, is that of showing in what manner the productivity of nature, which is not matter, passes over into the world of products. "The chief problem of *Naturphilosophie* is to explain, not the active in nature, but the permanent."[2] But now this permanent is that which physical science recognizes as matter, from the qualities of which it seeks to explain all physical phenomena. Accordingly, the explanation of permanence resolves itself into an account of the manner in which matter as a persistent product arises through the activity of a spiritual principle. "The sole problem of the Philosophy of Nature is the construction of matter."[3] It must be possible to exhibit the material world as resulting from absolute spirit. In this sense, then, *Naturphilosophie* is a construction of the objective world upon the basis of idealism. Spirit is the *prius*, nature results from it and has merely a derived reality. It is the object of the Philosophy of Nature to present matter in this conditioned relation to spirit. "By this deduction of all natural phenomena from

[1] Schelling, *Sämmtliche Werke*, Bd. III, S. 279.

[2] Ibid, Bd. III, S. 18.

[3] Ibid, Bd. IV, S. 3.

an absolute hypothesis; our knowing is changed into a construction of nature itself, that is, into a science of nature *a priori*." [1]

But although the task of a theoretical construction of materiality, in this sense, is one that may be legitimately proposed to any philosophy, it is surprising how much misunderstanding has been caused by Schelling's statement that *Naturphilosophie* must construct nature. It has been taken to mean that the philosopher, resting firmly upon the ontological principles of his metaphysics, must strive to deduce from them the particular nature of matter and the laws which by its construction matter must obey. He attempts to do this, it is supposed, without any reference to the teachings which experience may offer, by *a priori* deductions from conceptions. The devotee of *Naturphilosophie* is assumed to believe that he finds in metaphysics sufficient grounds for rejecting theories which science accepts, theories which are purely scientific and have no metaphysical character. In opposition to these scientifically sound and metaphysically innocuous theories he sets up theories which are usually metaphysically bad, but especially are for science rubbish. For these latter views he advances no sufficient scientific support, but rests purely upon his *a priori* deduction. Concerning the value of this pleasant dream of *Naturphilosophie* the friends of empirical science do not hold two opinions. The modern physicist declares that not one characteristic of matter or principle of physical action can be established by *a priori* reasoning. From Newton's warning against metaphysics to Tait's fierce tirades against *a priori* theorizing upon physical subjects the tide of scientific opinion has run strongly against deductive *Naturphilosophie*.

Now it is not to be denied that much of the censure directed against *Naturphilosophie* by men of science has been deserved. It was due, however, largely to a misconception of the purpose

[1] Schelling, *Sämmtliche Werke*, Bd. III, S. 278.

and intent of a speculative Philosophy of Nature. An idealistic treatment of this problem which retains its sanity is not obliged to contest any legitimate deliverance of empirical science. When the scientific theory is expressed in terms which carry with them perverse metaphysical assumptions, it sometimes becomes necessary for the philosopher to insist that the theory in question is not purely scientific. What he is actually opposing, however, is the metaphysics involved, and not the empirical knowledge that is systematized by the theory. He is laying no claim to the right to use philosophy as an instrument of scientific discovery or of proof apart from experience. The matter has been well put by Schelling: "The assertion that natural science must be able to deduce all its principles *a priori* is in a measure understood to mean that natural science must dispense with all experience, and, without any intervention of experience, be able to spin all its principles out of itself—an affirmation so absurd that the very objections to it deserve pity. Not only do we know this or that through experience, but we originally know nothing at all except through experience. * * * But every datum which is merely historical for me, a datum of experience, becomes, notwithstanding, an *a priori* principle as soon as I arrive, whether directly or indirectly, at insight into its internal necessity. * * * *It is not therefore that we* KNOW *nature, but nature* IS *a priori;* that is, every individual in it is predetermined by the whole, or by the Idea of a nature generally. But if nature *is a priori*, then it must be possible to recognize it as something that is *a priori*, and this is really the meaning of our assertion." [1]

This ought to be a sufficient guarantee that *Naturphilosophie*, so long as it remains within its legitimate sphere, will not attempt to establish scientific hypotheses without regard to the facts. If in carrying out this work Schelling did not remain within the legitimate sphere of *Naturphilosophie*, that does not prove the task itself a mistaken one.

[1] Schelling, *Sämmtliche Werke*, Bd. III, S. 278-279.

But although Schelling grants by these statements that he is not justified in deducing from metaphysical principles the particular rules of the material world, in two important respects he offends against the spirit of this admission. In the first place, he offers fanciful scientific hypotheses, and exhibits them as necessarily resulting from his more fundamental principles. In fact the logical connection is always faulty, and therefore the weakness of the theories apparently deduced does not for the philosopher impeach the principles from which they are said to be derived, although it has rendered the whole work unpopular with men of scientific temperament. The second point is of greater philosophical importance. Schelling insists in sober earnest that the entire body of doctrine which he calls dynamics may be constructed *a priori* without recourse to experience.[1] By dynamics he here means the theory of matter, not in so far as matter is regarded as in motion and interaction, but in so far as it is regarded as composed of moving forces. It will be found that Schelling's success in establishing those features of his dynamics which he regards as sustained chiefly by *a priori* considerations has not been such as to vindicate the validity of the method. If he had held firmly by his principle that we do not spell out nature by *a priori* method, but only aim to recognize it as something that really *is a priori*, he would perhaps have escaped censure upon this point. By disregarding it, however, he has given an opportunity for Lotze and others to urge with justice that we cannot hope to *construct* reality, but must be contented if we can be so fortunate as to *recognize* it in its true character. It is true that we cannot construct nature, but if nature is a construction of spirit, is *a priori* and we recognize it in its true character, our philosophy of nature becomes a recognition of nature as an *a priori* construction. The principles which form the content of our Philosophy of Nature may be elaborated *by us* with the most

[1] Schelling, *Sämmtliche Werke*, Bd. II, S. 276.

painstaking scientific induction. Independently of our subjective mode of attaining to the knowledge of these principles, however, the principles themselves must be regarded as in a logical connection and subordination, the conscious articulation of which for our minds is the setting forth of an *a priori* schematization of thought. The method of science may be *a posteriori*, but its ideal goal is an *a priori* one.

D. *Relation of the Idea of Matter to the Theory of Perception.*

A transcendental exposition of the idea of matter must show how the idea is connected with the functioning of the intellect, and point out its origin in human knowledge. It is this task that Kant failed to perform. His method was that of analyzing the idea of matter, conceived as that which fills space in a definite degree. But this analytical mode of procedure is thoroughly objective, and does not establish the connection between the idea of matter and the intellect which engenders that idea. To this method Schelling opposes the synthetic construction of matter. The conception is to arise gradually before our eyes, and we are to find in its origin the ground of its necessity.

But now, if we grant, with Kant, that matter is constituted of two forces, whence do we get the conception of those forces? It is of course possible to answer, says Schelling, that we get it by inference. We do indeed get the conception by inference, but a *mere* conception has no meaning. If the conception is to possess any real significance, that must be gained from perception. It is only by the fact that conceptions are founded upon perceptions that they relate to reality. Granted that we are able to imagine attractive and repulsive forces—that fact only makes them a mere thought product. What we wished to assert, however, was that matter, as composed of real forces, actually exists. Now reality is given us, not mediately by means of concepts, but immediately in perception. If then attractive and repulsive forces are to be as-

cribed to matter, the grounds of such attribution must be found in perception. If it can be shown from the characteristics of our perception that the object of perception must be regarded as the product of attractive and repulsive forces, these forces become conditions of the possibility of perception itself, and from this fact they derive the necessity with which they are thought.

Thus Schelling argues, and at this point he makes a false step. He has shown that since it is only in perception that our ideas gain reality, perception must furnish the basis for any theory of the composition of matter. This harmless proposition is one with which empirical science can heartily agree. For the scientist it means that no theory not based upon the deliverances of perception can claim validity. Schelling understands it to mean, however, that we are to find a basis for the theory of matter in the *theory* of perception, rather than in the facts which it offers. The argument is not that we perceive matter as acting so-and-so, and are accordingly forced to infer that in order to render such action possible its composition must be of a certain definite character. The argument rather is that since matter is the object of perception, the elements which go to construct perception must also go to construct the object of perception. Matter, then, will be constituted for physical theory in the same way as is perception for the science of knowledge. This reasoning is clearly erroneous. The discussion of the general implications of the subject-object relationship does not settle the theory of the more intimate constitution of matter.

The error of supposing that the theory of perception affords the key for an *a priori* theory of matter is the source of many of the difficulties encountered by the *Naturphilosophie* in the field of metaphysics. The position could be maintained only by the assertion of the identity of matter and cognition, and therefore rendered necessary the support given by the Philosophy of Identity. The error is of less importance for the

Philosophy of Nature itself, however, from the fact that Schelling deceives himself in believing that his theory of th construction of matter is derived strictly from the theory of perception. In fact it is derived much as was that of Kant, by analyzing the idea of matter; and it is therefore able to maintain itself on its merits, until a deeper connection can be shown up with the principles of idealism.

But now if, as Schelling holds, the reason for the necessary ascription of opposed forces to matter lies in the nature of perception, we are driven to ask, What is the nature of perception? Pure theoretical philosophy gives an adequate answer upon this point. For perception, there is presupposed on one side an activity of the intellect, an activity which is not checked or limited by anything in its own nature. Bu on the other hand there must be opposed to this naturally infinite ideal activity another activity of mind, by virtue of which the first is checked. Only thus can a definite product arise. If the ideal activity were allowed to continue unchecked to infinity, it would remain a mental act, to be sure; but no mental fact, no determinate idea, and therefore no consciousness could ever arise. The real activity which opposes the ideal one is negative in the sense that all we can predicate of it is its limitation of the positive ideal activity. The product in which the two are united is the finite perception.

From this view of the rise of perception it becomes clear that the world of phenomena results from an original strife of opposed spiritual activities. All reality (*Wirklichkeit*) is nothing else than that strife, in its infinite productions and reproductions. A world exists, then, only for spirit, and since the actual world is not entirely known by any finite spirit, it exists for an infinite spirit. On the one hand there is no objective existence (*Dasein*) without a spirit to know it, and on the other hand there is no spirit for which a world does not exist.

At a higher grade of cognition the mind comes to view

itself as that which knows, and to recognize its own freedom. In order to feel itself free and the subject of knowledge, however, it must ascribe independence and objectivity to the product. It is in this way that the subjective and objective worlds become separated for consciousness. The objective world then stands before the mind as something independent of it. But in the object those opposed activities by which it was produced in perception have now become permanent. They there appear as the forces of matter. These activities are of a spiritual nature, it is true; but their mental origin lies outside of consciousness, since by them consciousness first comes into existence. They seem, then, to be not of mental nature, and even to be opposed to mind. In this light they appear to belong to the object by itself, regardless of a possible intelligence.

Now we may concede, I suppose, that for idealistic philosophy force must be reduced to factors operative in consciousness. It cannot be, as with Spencer, a great Unknown lying beyond the phenomena, where conscious experience can never reach it, but must be implicated in the very fibre of experience. But the particular manner in which Schelling wishes to pass from the theory of perception to the theory of matter should be closely scrutinized. Let us concede that for perception the world is formed by the opposition of two activities; does it follow that after consciousness comes to distinguish a subjective and an objective world, and after we direct our attention solely to the theoretical construction of the objective world, we shall be able to find in that the same opposition of limiting and unlimited activities? By no means.

According to the account given by Schelling in the *Transcendental Idealism*, it is the ideal activity, the activity which extends beyond the check given by its opposite, which becomes transformed for consciousness into the world of things. The real activity, on the other hand, as soon as the opposition between the soul and the world of things becomes explicit, is

fixed for consciousness as the independent soul, the Ego-in-itself. So long, then, as no distinction between subject and object has occurred for consciousness, he who separates out from the rest any bit of cognitive experience will find implied in it both of the activities in question. But as yet it is impossible to speak of a nature at all. In knowledge as it actually exists, however, the abstraction of the object from the subject has been carried out. Only after this abstraction has been made can we with any propriety discuss the theoretical constitution of the world of objects. But in analyzing the process by which this distinction arises Schelling finds that only one activity is concerned in the construction of things conceived as independent of consciousness. That is the ideal activity, which, not stopping at the mere fact of perception, goes on beyond the check and attempts to explain to the Ego the rational grounds for the perception. The thing-in-itself is therefore the shadow of the ideal activity of the self. So long as it remains purely objective, it has nothing to do with the opposed activity; although the theory of knowledge, overcoming this abstraction, looks at it in its relation to the subject. For the purposes of the science and philosophy of nature, however, it is entirely legitimate to make this abstraction. But *if* we take nature thus as independent, we have rid it of its subjection to the condition of perception, and are considering it purely theoretically. Theoretically, however, the objective world is wholly the construction of the ideal or explanation-demanding function of intelligence—the other activity is not operative in this field. To be sure the ideal activity, as one of the elements necessary to knowledge, implies the continual opposition of its antithetic activity. It is *knowledge*, however, and not the theoretical construction of the *object* itself, that implies this opposition. The theory of matter, then, must be carried out in entire dependence upon the rationalizing or ideal activity of mind.

This conclusion is of much importance to our criticism of

Schelling. The latter had espoused the cause of dynamism in physics, but regarded himself as bound by his metaphysics to a certain form of dynamism. Matter must be composed of an infinite expansive force and a limiting attractive force, a synthesis of the two being effected by the force of gravitation. This entire doctrine, which he called dynamics, Schelling regarded as demonstrable *a priori* from the theory of knowledge. But we find that in his attempt so to connect the theory of matter with the theory of perception that the former may appear as deduced *a priori* he is guilty of a mistake in the inference. The deduction is faulty.

The philosopher, then, who should accept the more general principles of idealism from which Schelling starts out, and even indorse his general conception of the problem and method of *Naturphilosophie,* is not bound to give adherence to the particular theory of the construction of matter which Schelling believed he had deduced from those principles. And this result may afford relief; for dynamism in the form presented by Kant and Schelling was not without its scientific difficulties. To chemists, in particular, it was obnoxious; for while chemistry opposes nothing to dynamical conceptions, as is clear from modern Energetics, yet it found in Schelling's theory no genuine foundation provided. In fact it remains a problem for close empirical study, the problem of the more intricate constitution of matter. That study may be led by philosophical motives, and its theoretical validity may in fact stand or fall with the validity of idealistic categories in philosophy, to such a degree that empirical study cannot be *opposed* absolutely to philosophical synthesis; but a speculative construction of materiality which aims to dispense with it altogether is in any case baseless.

A second general line of criticism is opened up by the reflection that the transcendentalist has imported these opposed activities into the theory of perception simply by reason of physical analogies. The categories which must be developed

in order to treat the theory of knowledge are the highest and most involved that we gain in any type of science. In Hegel's formulation, the categories of the Notion are alone adequate to this problem; all others, and particularly those of dynamical science, make their shortcomings apparent in this field. And it is obvious that essentially this position must be held by philosophy, if the root conceptions of idealism are to be maintained as against a naturalistic mode of thought. If the knowing relation could be exhaustively defined in terms of physical categories, there would be an end of idealism. No doubt all scientific categories, and therefore those in which the theory of perception and conception is expressed, are attempts to formulate insights into Universe Order; and no doubt physics finds it easiest to discuss universe order in terms of its categories. These categories, however, do not exhaust the implications of any single act of knowledge, and are in fact only abstractions from certain of the relatively simple forms in which the conception of Universe Order is revealed within our consciousness. The physical analysis of motions was already foreshadowed in the idea of opposing forces brought forward by Heraclitus, and the Protagorean theory of knowledge availed itself of this idea. It is easy to grasp, and is therefore popular. Empirical psychology uses it, although even psychology passes beyond it. Fichte's *Science of Knowledge* picks up the ideas without criticism, because its ultimate purpose is to pass beyond them. The fact that they figure in certain portions of the *Wissenschaftslehre*, then, by no means confers upon these opposing activities a fundamental philosophical importance.

In short, the two opposing activities occur in the theory of perception chiefly by reason of physical analogies. They creep in without criticism. The thinker who should then turn about and "deduce" physical theories from them would be reasoning in a circle. Universe Order in some form is essentially involved in perception, and in some lower and more ab-

stract form it will constitute the theme of physical theory; but what form it shall take for physics must be determined by the analysis of physical experience, and not by the theory of perception. If we first wrap up in our theory of perception some special physical preconceptions, it is no great intellectual achievement to find them there again.

E. *Matter as a Force-Product.*

We have criticised Schelling's deduction of the theory of matter. It remains to examine that theory on its merits.

The theory runs very closely in accordance with that of Kant, although it varies somewhat in different presentations. In general, however, Schelling conceives his task to be that of connecting the dynamical interpretation more closely with transcendental philosophy. At the close of the discussion of the line of thought already examined, he says: "We have now reached the point in our investigations where the idea of matter becomes capable of analytical handling, and the principles of dynamics can be derived from this idea alone. This work, however, has been done in Kant's *Metaphysical Basis of the Natural Sciences* with such evidence and completeness that nothing further is left over to supply here." [1] Some additional comments are suggested, and in other presentations a more considerable difference appears, but no essential injustice will be done to Schelling by discussing his theory in this form.

Now there are two great difficulties with a physical dynamism of the form here presented. In the first place, the two forces which it postulates are only elements of conceptual analysis, and we can gain no warrant for holding that they correspond to any real cleavage in the nature of things; that is of things as they are for absolute thought. In the second place, the entire dynamical view of nature presupposes certain non-dynamical or Platonic elements; so that however

[1] Schelling, *Sämmtliche Werke*, Bd. II, S. 231.

successful its polemic may be against the metaphysical hypostatization of corpuscular mechanics, its own thought also is inadequate.

The first objection does not assert that these forces are entirely arbitrary. On the contrary, just because all analysis really implies a previous synthesis, and because the elements which are analyzed into these forces were synthesized from experience, they do have reference to objective reality. But they are artificial expressions for the understanding of that which in reality is bound up together.

Schelling partially recognizes that this is the case, but strives to avoid admitting it. "The fundamental forces of matter," he says, "are therefore nothing more than the expression *for the understanding* of those original activities, the reflection, not the reality itself, which is in perception." [1] "In reflection we may separate the two; to think them as separated in reality is absurd." [2] Indeed, it is because they are concepts and not the realities, that we are able to make them definite as explanations of the nature of matter, and found upon them the science of dynamics. Passages of this sort may be multiplied, but are not entirely free from ambiguity. Against these may be placed a number of citations having an opposite tenor. Speaking of attractive force, he says, "But one must not think that one can derive it from some merely logical predicate of matter—I know not what—according to the law of contradiction alone. For the idea of matter is itself, in its origin, synthetic. A merely logical concept of matter is absurd, and the real concept of matter itself first arises through the synthesis of these forces by the imagination." [3]

The real basis for the apparent opposition between these passages is found in Schelling's claim that Kant's theory had been left as purely analytical and logical; that his own, how-

[1] Schelling, *Sämmtliche Werke*, Bd. II, S. 228.
[2] Ibid, S. 234.
[3] Ibid, S. 235.

ever, by pointing out the original synthesis of opposed activities in perception, had changed the entire standing of the conception and given it real import. If we take the notion of matter as it stands in ordinary consciousness as the basis for analysis, as did Kant, Schelling agrees, both in the passages quoted and in others that might be cited, that the distinction is in danger of representing merely a self-made opposition of ideas, and not a real opposition of objective forces. But since his own transcendental deduction, which was to save the day for the attractive and repulsive forces, has been found inadequate to do so, dynamism has not succeeded in safeguarding the objective significance of its two historic basal forces.

This result does not impugn the principles of dynamism, but simply the form which it took with these writers, and readily tends to take. It reinforces the conclusion already drawn, that for a consistent idealism the theory of matter is to be drawn, not from *a priori* reasonings, but from a study of the implications of physical experience. Idealism holds, to be sure, that knowledge is idealization, and that no scientific theory could take from except through the leadership of a conception of Absolute Order—an element of knowledge not copied from sense. In dealing with the concept of matter, then, speculative thought may direct its attention not so much to the properties manifested as to the ground in which they are founded. Analysis consists in so working out the thought of this ground of connection that it can serve as an explanation of the manner in which the qualities exhibited in sense do actually cohere and reciprocally condition one another. It is obvious that such an analysis can be carried out only on the basis of the properties actually to be explained. It is the *Auseinandersetzen* of the implications involved in the notion of a general ground for the properties of matter, and if these implications are to be fully set forth account must be taken of all the modes of behavior of matter which are to find explanation therein.

An analytical process which is carried on thus with constant reference to the synthesis of elements by the aid of which the idea of matter is built up cannot be charged with dealing in purely self-made conceptions. It is true that the elements into which it resolves matter are concepts. But unless we are to be plunged into a thoroughgoing phenomenalism—an impossible philosophy—properly formed concepts must have an objective significance. The possibility of science in any form rests upon our right to formulate concepts which are applicable to facts. We can never reach a principle of explanation, and so a true science, except as we go beyond the facts presented. This is the transcendental factor in science. In so doing we rely upon the conviction that things are in reality constructed upon universal principles, our problem being only to find out what in particular those principles are. Here the transcendental element is specifying itself as the dominant universal, a rational idea which judgment is postulating as real. In adopting any principle of explanation we can be certain that it is the correct one only by repeatedly testing it to be sure that the facts readily arrange themselves in accordance with it. The distinctions which we make are primarily ours, and it is only after working out our theory to its results and testing it fully and repeatedly by the facts that we may be permitted to maintain that the distinctions obtain in reality precisely as we have drawn them.

It follows that the forces which we are to attribute to matter even as the result of an analysis of what is involved in matter must issue only from a careful study of physical phenomena. Whenever facts are discovered which render it evident that a division like that made by Kant does not represent reality, a new foundation of the concept is in order. Hartmann is therefore justified, so far as philosophy is concerned, when he supposes that atoms of one kind possess only attractive force, those of another kind only repulsive force. He has dispensed with the idea of a purely negative force, an attraction, neces-

sary to limit the expansion of the repulsive force, and supposes that expansion exerts from a given centre only a definite quantity of force. The absurd view of Kant and Schelling that an attractive force is necessary to keep repulsion from expanding the body to infinity is rejected. For Hartmann the attraction exerted by body atoms increases inversely as the square of the distance, while the repellent ether atoms exert a force of resistance which increases inversely as a higher power of the distance, probably from the third to the fifth. By Boscovich and others it was supposed that the atoms exert an attraction for one another at molar distances, but at molecular distances a repulsion which increases very rapidly with the decrease of the intervening distance. It is clear that none of these speculations are ruled out by metaphysical considerations. The only criterion of their value, then, is the success which they meet in introducing order into facts.

The second objection to dynamism urged that other factors besides force were necessary to the theory of matter. This objection has different values according to the two different levels at which it is raised.

When raised by the popular mind, or even by most partisans of the mechanical theory of matter, it expresses a truth in form so feeble and obscure as to be almost useless. One comes to speak of matter and its forces, and then supposes that independently of his thought and language matter and force bear such a relation to one another as these words imply. A separation of matter from force takes place, which leaves it incomprehensible how they can act together. This is a common result of the metaphysics of ordinary thought. The mind looks for something which shall be permanent and the common ground of our changing sensations. The mechanical conception of matter, as inert extended substance, explains permanence, and furnishes a general ground for sensation. The element of change is not sufficiently illuminated by this conception, however, and the idea of force as a cause of motion

is added. With these two factors popular thought can get on; but it sees in the conception of force alone no explanation of the permanence and law which rule in nature. Activity may well be caprice.

To physicists, however, it soon becomes apparent that an ultimate duality of force and matter is not defensible. The effort ensues to eliminate one of the conceptions, and corpuscular mechanics, as Schelling called it, eliminates force. It assumes matter as being in motion. Maxwell says, "Force is but one aspect of that mutual action between bodies which is called by Newton Action and Reaction."[1] Force becomes a mere formula, valuable for the expression of mathematical relations, but not the concept of some real thing causing the relation. A thoroughgoing phenomenalism is thus applied to the idea of force, even when it is not so applied to matter and motion.

Now phenomenalism is an excellent methodological device in a special science, especially if it is fairly and evenly applied; but it is of no avail as a thoroughgoing theory of matter. For every judgment by its very nature claims to be a declaration regarding truth; and this primal claim of reason is indefeasible. A consistent and thoroughgoing phenomenalism is impossible. In fact, then, no category of science is wholly phenomenal in its import; in each the real order of the world is more or less successfully seized. And accordingly few minds can really hold the thought of the phenomenality of all scientific ideas. The attempt to treat force as phenomenal usually issues in ascribing reality to matter, motion, and space.

But this course cannot be followed out, for it leads into new and insuperable difficulties. Modern physics is founded upon the doctrine of the conservation of energy. It is only by means of the distinction between potential and kinetic energy, however, that this principle can be made to work. The active or kinetic energy involved in any physical change is not neces-

[1] Maxwell, *Matter and Motion*, CI.

sarily conserved as kinetic, but may become potential, and *vice versa*. But if energy is to be defined as a relation of masses and velocities, the assertion that the energy involved is conserved would necessarily mean that in a set of physical changes the solution of the force-formula, a relation of masses and velocities, will always be the same. But since the mass must remain constant, on atomistic principles the velocities must also remain constant. In other words, all energy must be active at every moment. This involves the denial of potential energy, and the reduction of all force in the world to kinetic energy. That the principles of corpuscular mechanics, strictly carried out, lead to this result, has been recognized. Stallo says, "The proposition here insisted upon is irrecusable by any consistent advocate of the mechanical theory."[1] Tait, speaking of the classical theory of corpuscular physics founded by Le Sage, says, "The most singular thing about it is that if it be true, it will probably lead us to regard all kinds of energy as ultimately kinetic."[2] And yet a reduction of all energy to the kinetic form, on these purely *a priori* grounds, is not satisfactory, since it is only by the aid of the assumption of energy in the potential form that the principle of the conservation of energy can be applied to the facts. It is not as if the corpuscular theory had devised some other way of meeting the difficulty. We are dealing with a sharp opposition between clear deductions from its theory and the established principles of physics.

We may conclude that the attempt to hypostatize matter to the exclusion of force is incapable of success, and that the division of the physical object into two real principles, matter and force, is unsound. Every static quality displayed by a thing may be explained, and must be explained by some power which the thing possesses to make itself good in its system.

At a higher level, however, a more serious type of objection to

[1] Stallo, *Modern Physics*, p. 67.

[2] Tait, Lecture on *Force*.

the sufficiency of dynamism arises, and renders necessary, as I judge, important modifications of its doctrine. Stallo, after urging that matter *per se* is indistinguishable from absolute nothingness, adds the following: "And, on the other hand, pure force is equally nothing; for if we reduce the mass upon which a given force, however small, acts, to its limit—or, mathematically expressed, until it becomes infinitely small—the consequence is that the velocity of the resulting motion is infinitely great, and that the thing is neither here nor there, but everywhere—that there is no real presence. It is impossible, therefore, to construct matter by a synthesis of forces. And it is incorrect to say, with Bain, that 'force and matter are not two things, but one thing,' the truth being that force and inertia are conceptual integrants of matter and neither is in any proper sense a fact. The radical fallacy of the corpuscular as well as the dynamical theory consists in the delusion that the conceptual elements of matter can be grasped as separate and real entities. The corpuscular theorists take the element of *inertia* and treat it as real by itself, while Boscovich, Faraday, and all those who define atoms or molecules as 'centers of force' seek to realize the corresponding element, force, as an entity by itself. In both cases products of abstraction are taken for kinds of reality." [1]

This passage clearly presents one of the dangers, or perhaps shortcomings, of dynamical theory, namely, a conception of force so narrow and poor that it falls far short of supplying the ground of all physical qualities. So long as force is defined simply as the cause of motion, the definition loses sight of the particular kind of motion caused. And yet we never experience pure motion. Any experiential motion has some definite direction and velocity. Force may be as Schelling conceives the absolute productivity of nature passing over into objects, but scientific knowledge tells always of Cosmic Order, and force, if it is to construct matter, must bear within itself

[1] Stallo, *Modern Physics*, p. 161.

the orderliness and system of the world. Schelling has said that it must explain permanence; and if it is to do this the ordinary dynamical categories are inadequate. The principle of change alone cannot construct a rational cosmos, as Heraclitus found. The law which ordered his flux became for Plato the ideal order of the universe, and even the restoration of dynamism by Aristotle did not dethrone it. To Leibniz, also, harmony was more ultimate than dynamism, so that every force energized according to its own peculiar relationship to the plan of the universe. It is strange that Kant, whose theory of the categories restores the Platonic conception of the synthetic identity of form in all scientific knowledge, had at the time when he wrote the Metaphysic of Nature no consciousness of the relativity of dynamism to systematic order. A close logical analysis makes it apparent, however, that dynamical categories alone are never sufficient. If an atom is to be conceived as a force centre, we are compelled to add at once that it is a centre which energizes according to a characteristic law or program, and that the formula of its action is the most essential thing about it. And then we are back upon Aristotelian rather than Heraclitic grounds.

This line of thought became gradually clear to Schelling, however, and was even more explicit in the subsequent development of idealism by Hegel. Schelling says that *Naturphilosophie* aims to explain permanence. In the *Introduction to the Outline of a System of the Philosophy of Nature* he handles the problem more fully. He treats the conditions of static order which arise in nature as conditions of Indifference, involving an equipoise of forces. This is a secondary thing, an effect of dynamism. Deeper than Indifference, however, and deeper also than the dynamism which generates Indifference, is the order which governs the productivity of nature. The name which Schelling gives to this order, Identity, serves to indicate its transcendence over the seethe and turmoil of the dynamism of nature. Nature as product man-

ifests more than activity, it manifests system and order. Yes, but this requires the thought that nature as productivity is essentially order-imposing. Every dynamical concept will therefore require to be read in this light.

The difficulty which Schelling experienced in working out the conception of an Absolute Identity led to Hegel's formulation. With him the Absolute is more distinctly conceived as rich with differential detail, but all members are held within the clutch of the system-ordaining One. And now, the Hegelian Logic sublates the dynamical categories as truly as it does the categories of corpuscular mechanics, or even of common sense. True, they are higher in the scale, and carry a richer insight than the others mentioned. Yet not much can be claimed for them on that account; for they belong, after all, to the second only of the three great stages of philosophical insight, the doctrine of Essence. They have not attained to the explicit consciousness of the Notion, the immanent ideal order of the universe. They fall short, therefore, of the characteristic insight of idealism; and however valuable they may be as means for tearing thought away from the cruder types of realistic metaphysic, they must be confessed to be inadequate to the thoroughgoing treatment of any fact whatever. Idealism is not engaged in teaching that nature is the manifestation of "blind force." That doctrine accords better with realism, especially if the latter be of a "transfigured" type. Things are the unfolding of reason, plan, concept; and whatever place activity may take in their generation, the philosophical account of the activity must never lose sight of the plan and order which give meaning and rationality to the process. In the realm of physical concepts, the elements of order are interpreted through such concepts as mass, inertia, and other mechanical categories, as well as being bound up in every thought more distinctly dynamical. It is only a revised dynamism, then, that can hope to cope with the entire range of physical theory.

The general result of our discussion of matter as a force-product, then, has been to show that the construction of matter from two forces has not sufficient objective warrant, but is in danger of affording a purely subjective analysis; and that dynamism in any form, although helpful to idealism against its traditional adversaries, is not ultimate idealism, and is not by itself sufficient to the thorough speculative treatment of physical facts. The only force which can satisfy the demand is a force which takes up into its definition relations of universe order.

F. *Gravitation as a Systematizing Factor.*

In his treatment of gravitation Schelling breaks away from the doctrine supported by Kant in the Metaphysic of Nature. We have thus far spoken as if for Schelling two forces in opposition were sufficient for the construction of matter. In his earlier works that is the case. When he wrote the *Outlines*, however, he had been led to see that Kant's attractive force did not furnish an adequate account of gravitation. At that time he still held that attraction and repulsion were sufficient for the construction of matter, so long as one regards it merely as that which fills space, and that with these dynamical theory would be satisfied. When we come to mechanics, however, and regard matter as in motion and interaction, we must have a third force to bind all physical nature together. He regarded gravitation at that time not as something essential to the very existence of matter, but rather as necessary for its interaction. In the *Transcendental Idealism*, however, gravitation becomes the construing agent by virtue of which attraction and repulsion are held in opposition, thus making possible the existence of matter. It is then of more vital importance to the construction of the physical object than the other two forces. As this development of Schelling's thought indicates an effort to supply in some degree the deficiencies in dynamical theory discussed in our last section, it calls for a brief consideration.

In order to appreciate the grounds of Schelling's criticism of Kant upon this point, it will be necessary to recur to Kant's view of gravitation. The latter had maintained that "the possibility of matter requires an attractive force as its second real fundamental force."[1] The reason for this assertion is the familiar one that expansion cannot limit itself, and must therefore dissipate matter to infinity unless checked by an opposed attraction. In this Schelling agreed with him, but became more cautious after he had noted the paralogism into which it led Kant. Accordingly he rejects the name *attractive force* in his later works, substituting for it, at least when he wishes to be precise, the term *retarding force*. The correction is significant and well founded, since the only reason for assuming the second force was to secure a principle upon which we may explain the retarding of expansion. We have seen that our inability to explain this retarding force from the mere concept of expansion does not justify us in supposing that the accessory principle which for ideal purposes we bring in is in fact distinct from the principle at work in repulsion. Kant says, however, that attraction is the second "wesentliche Grundkraft" of matter. Schelling admits that the reason given by Kant for holding attraction as real as repulsion is insufficient, but, as has been shown, finds grounds of his own for maintaining the same conclusion. For Schelling, however, who is here more consistent than Kant, attraction is only a negative force, it merely retards expansion.

On Kant's view, attraction is distinguished from repulsion by the manner in which it works. Repulsion, working outwardly from a centre, acts continuously up to the point at which it is checked. Beyond that point it does not act, simply because it has been checked. One might suppose that it would work even beyond the point at which it became so weakened as to come to an equilibrium with its opposite, although of course owing to the preponderance of attraction outside the

[1] Kant, *Werke*, ed. Rosenkranz, Bd. V, S. 358.

periphery of limitation it could have little effect. No sufficient reason is given either by Kant or Schelling why repulsion cannot act at a distance, and according to the theories of Boscovich and v. Hartmann such action does take place.

Kant urges, however, that attraction must act at a distance, since the making definite of any given quantity of matter, and therefore the establishment of things as distant from one another at all, is a result of the action of attraction. Contact, then, presupposes a previous attraction which made the bodies definite in form and mass. But since contact depends upon the previous action of attraction, we cannot suppose that the possibility of attraction depends upon contact. It must be prior to contact, and act immediately at a distance.

It ought to be noticed, however, that before contact can take place two things are necessary. In the first place, bodies must exist having definite determinations and boundaries. On the reasoning of Kant and Schelling, this condition depends upon the action of attractive or retarding force. But now in the second place, bodies must do more than exist—they must be so drawn or thrown together in space that their boundaries may touch. This last condition is not necessarily satisfied by the action of a force, the only reason for assuming which was to explain the definite limitation of bodies. It does not follow from the analysis of the idea of a particle of matter in a static condition that all such particles *must* gravitate towards one another. We have to learn it first from the fact that they *do*.

Kant declares that attraction not only acts at a distance but that it is a penetrating force; that is, by means of it one body exerts force upon the parts of another body, immediately, and without regard to intervening bodies. He supposes that this property follows from the concept of attraction, and his proof of it consists in showing that attraction can be destroyed neither by intervening bodies nor by extent of space. That the attraction of one body is able to seize upon the mass

of another, and draw it toward its own centre, he assumes without question.

At this point Schelling joins issue. He says, "Kant, in his *Metaphysical Basis of the Natural Sciences*, calls the attractive force a penetrative force, but he does this only for the reason that he regards the attractive force as already gravity, whereby also he requires only two forces for the construction of matter, while we deduce three as necessary. The attractive force thought purely, that is, as a mere factor of construction, is to be sure a force which works immediately at a distance, but not a penetrative force, since there is nothing to penetrate where nothing exists. It first gets its penetrative properties from the fact that it is taken up into gravitation. Gravitation itself is not identical with attractive force, although the latter necessarily enters into it." [1]

The ground of Schelling's dissent from Kant appears more clearly from another passage: "Now in order to explain how the production of nature is originally directed upon something *definite*, there must indeed be something negative assumed in every infinitely productive activity, which negative, if all productive activity of nature is only an evolution from *one* original involution, must be the very principle which retards the evolution of nature. In short, there must be an original retarding principle. To explain this retarding principle, to show why nature develops itself with a finite rapidity, will, it is true, appear as the highest task of the Philosophy of Nature. But only on the lowest standpoint, that of the consideration of the product as mere space-filling, can that retarding principle appear as attractive force. And now moreover this principle serves only to explain the finite, the determinate in general in natural production, but not to explain how one object comes to be finite in relation to another, how for instance the earth is heavy towards the sun." [2]

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[1] Schelling, *Sämmtliche Werke*, Bd. III, S. 444.

[2] Ibid, S. 102.

Gravitation, then, cannot be explained from the idea of matter as that which by virtue of moving forces fills space. Schelling develops a theory of gravitation which is to supplant the hailstone theory of Le Sage and the two-forces theory of Kant. For him the nature and origin of gravitation must be considered in connection with the development of the sidereal and solar systems.

Gravitation is an immaterial principle, as Kant and the Newtonians asserted, not a material principle, as Le Sage maintained. It is a force by means of which the whole universe is bound together, and constituted one. It therefore pervades all matter, and extends throughout space to infinity. Ultimately, then, it has its source and ground in the unity of nature as subject. In its application to the particular bodies in a definite system, however, it is mediated by the commanding central body of that system. Schelling develops the idea of a sphere of affinity which is ruled by a body of commanding mass, and within which smaller bodies are subjected to power exerted by the central mass. This sphere of affinity is analogous to the field of force determined by the magnet. Just as in the magnet's field of force iron filings arrange themselves in definite positions with regard to one another, so in the sphere of affinity of the sun all parts of the solar system gravitate towards one another.

The source of this universal gravitation cannot be found merely in the bodies themselves. "There must certainly rule throughout the whole of nature *one* force, by which nature is preserved in its identity, a force which we have not yet derived, but to which we see ourselves now for the first time driven." [1] Such a force cannot be merely the mode of action of distinct bodies, it must be also something more universal. Now Schelling maintains that "what holds together a mass as a mere aggregate of bodies existing beside and beneath one another must be such an influence of a mass outside them as

[1] Schelling, *Sämmtliche Werke*, Bd. III, S. 105.

gives all their parts a tendency towards one another." [1] This mutual tendency of all parts towards one another, since it always remains a tendency, and never attains to union, can be really explained only as a common tendency of all to union with a third. Their reciprocal tendency towards one another, then, would be only apparent, just as the magnet gives iron filings an orderly arrangement with regard to one another. This common tendency to union with a third is then the binding principle which holds all parts together. This must necessarily be something outside the mass, and in the case of the earth, for instance, must be the sun.

In this way the sun influences all bodies in the solar system, its sphere of affinity, and produces the appearance of a reciprocal gravitation. The power of the sun to do this, however, is merely delegated. The fact that the particles of the earth gravitate towards the sun can be explained only by a third mass which by its sphere of affinity governs the sun. Thus we have an absolute despotism, in which the sun is, to be sure, the viceroy of the one absolute dictator so far as concerns the solar system, but it really only mediates to the bodies of the solar system a unifying power derived from the sources of nature itself.

It remained for Schelling to show in what relation this universal binding force of gravitation stood to the other forces in the constitution of matter. Like the others, gravitation also must be "transcendentally deduced." Now it had been shown that perception implies two opposed mental activities, but implies also an activity really more important than the other two, by means of which the latter are synthesized within one consciousness. This third activity is called by Schelling the productive perception, by Fichte the productive imagination. Taking up into itself as factors the real and ideal activities, the functioning of productive perception forms the true cord of conscious experience. Now just as repulsion and attraction

[1] Schelling, *Sämmtliche Werke*, Bd. III, S. 106.

had for Schelling represented ideal and real activities, gravitation represents the power by which the two are synthesized. "Just as the activity which is checked within the limit and the activity which goes out beyond the limit to infinity are only the factors of productive perception, so also repulsive and attractive force, which are separated only by their common boundary, are only the factors for the construction of matter, but not the constructing principle itself. This latter can only be a third force which synthesizes the two and answers to the synthetic activity of the Ego in perception. Only by means of this third synthetic activity was it comprehensible how the two activities could be posited as absolutely opposed to one another in one and the same subject. The force which corresponds to this activity in the object will therefore be that by means of which those two really opposed forces become posited in the same subject." [1]

We have already seen that this line of argument in Schelling possesses little value. It is significant, however, as showing in what light he regarded gravitation. Kant had attempted to render easy the conception of an immaterial principle of gravitation by showing that such a principle, in the form of attraction, is essential to the existence of a single particle of matter. Schelling points out with great clearness and success that this attempt must result in failure. His criticism of Kant on this point is decisive. He shows that gravitation must be a cosmic principle, not to be inferred from the concept of a piece of matter at rest, a concept which abstracts from all relations to other bodies.

It cannot be said, however, that the theory which Schelling offers in place of Kant's view is of great value as an explanation of gravitation. It does little more than to reassert in general terms the truth that gravitation does obtain, adding that it is an immaterial principle by means of which one body attracts another at a distance. This is no more than the New-

[1] Schelling, *Sämmtliche Werke*, Bd. III, S. 443-444.

tonians had said, but their view had been confessedly inadequate.

But the most significant thing about Schelling's treatment of gravitation is the fact that it indicates the point at which a physical dynamism of the type offered by Kant logically passes over into a deeper recognition of a systematizing order to which each material particle is organic. This thought in some form is unavoidable, and while physical theory must take it in an abstract form, without elaborating or analyzing it as thoroughly as does metaphysics, yet it must appear in the philosophy of physics. Schelling's achievement has been scarcely more than that of indicating a problem—perhaps not even that, in very clear form. Certainly his own discussion is inadequate to the solution of the problem of gravitation. One might infer that empirical research alone can throw light upon this problem, as upon every problem of the theory of matter. The remarkably backward condition of the doctrine of gravitation in modern physics, however, in the midst of an enormous mass of empirical material, helps us to recognize that the problem differs somewhat from ordinary physical problems. The familiar categories of physics are not adequate to cope with it, since it involves something which these categories all presuppose. One may expect that the problem will be attacked one day with great keenness of analysis and with a full knowledge of physical fact, in such a way as to yield gratifying results. Such results, however, can hardly fail to modify our present conceptions of matter, by dwelling upon the relation of each particle to a systematizing whole, and showing the manner in which this relationship becomes effective. It is true that there are deeper and more significant forms of systematic relation than gravitation can present; but until we have gained some fuller insight into this we do ill in passing it over so lightly as is generally the case. The problem is a real one and an intelligible one. It is not being treated by physics—it seems to fall outside physics. In equal degree it

falls outside philosophy. Yet it is on the borderland of the two and the completion of either physics or philosophy will require its more thorough handling.

It is true, of course, that for idealism the only real systematizing factor is the Absolute. But this thought comes in only when we ask for the *complete* meaning of the order in the world. The sciences read that order at various levels, and physics, in particular, reads it at such a level that the definition of physical systems as gravitational masses becomes of rational importance. It is by the appreciation of the way in which a theoretical analysis of matter leads inevitably from the dynamism of the parts to a recognition of the dynamical influence of the systematizing whole, and the necessity of stating that influence in intelligible and workable terms, that one may see the significance of Schelling's treatment of gravitation.

CHAPTER III.

CONCLUSION.

It is impossible, of course, to treat exhaustively in a monograph the interrelations of physical science and a world-view like idealism. The entire development of the discussion after Schelling must be left out of our explicit notice, although we have attempted to make use of that development in our analysis and criticism of Schelling. Many interesting chapters by the author of the *Naturphilosophie* himself must also be omitted, entailing a loss which is particularly significant in regard to the philosophical meaning of the atomic theory.

The limits of a monograph do not forbid, however, an estimate of the spirit of idealism, and its bearing upon the general view of the material world which has been organized into modern physics. It is this inquiry to which our interest is here restricted, and which we now wish to sum up in general terms.

Two things seem to have stood out throughout the entire course of the investigation: in the first place, the legitimacy, and even insistency, of such a transvaluation of physical values as was attempted in the work of the great idealistic philosophers of a century ago; and in the second place, the want of success on their part in making good the particular form of transvaluation which they proposed.

The legitimacy of the problem will be denied, of course, by all thinkers who regard the work of philosophical criticism as at all times baseless and impertinent. Such thinkers are accustomed to regard knowledge given in scientific form as the highest and most perfect to which man can attain, and as neither demanding nor permitting any critical revision at the

hands of the professed student of the theory of knowledge or of metaphysics. With such it is not necessary to reason here, since the mass of discussion in contemporary epistemology is directed against precisely this position, the dogmatism of science.

With thinkers not under the sway of an unphilosophical dogmatism, however, the conviction is general that the sciences of nature, although highly organized and successful, are limited in a certain characteristic manner. Their very success, and their power to still farther amplify their success, have been purchased at the expense of a very definite limitation of their problem. Certain ways of looking at things and categories of interpretation have been taken for explanatory purposes, because very successful at a certain level. The entire range of fact susceptible of illumination by some one category of interpretation, or some closely connected group of categories, becomes then the subject matter of one science. Facts not readily amenable to those categories simply fall outside the science, although they may be more or less closely related.

Now it results from this organization of knowledge that the treatment of its subject matter given by any special science is abstract. The science treats the facts; but it treats them from a special point of view and for special interests. It does not treat them in their full import and meaning, that is, in their full truth. What a given science offers is *true*, no doubt, if the work of the science has been properly done; yet if it is taken as *the truth*, it becomes misleading by reason of its abstractness. The categories in which any special science moves readily are too cheap and partial to express the truth of any fact, since every fact embodies the universal system of the world. Science, by reason of the necessary abstractness of its mode of treatment, puts forward only half-truths; and these half-truths, if carelessly or uncritically handled, are in great danger of becoming falsehoods. In large measure the defect of any given science is that of the incomplete and abstract

character of its constitutive categories, and therefore of its possible insight; in part, however, this carries with it the further fact that some aspects of the assumptions taken by the science are simply not true, but misrepresent the real. They are valuable, then, chiefly for their power to aid in freeing the subject matter from perplexing relations. Accordingly, the view of affairs presented by any science can never be taken as ultimate. It needs a peculiar type of revision, by means of which the defect arising from the necessary abstraction of thought may be supplemented.

To some degree the revision is carried out by the discussion of the subject matter by cognate sciences. As the system of the sciences approaches more nearly to completion, this correction may be expected to be more efficacious than it is today. At present, however, the chasm between the different sciences is too great to be effectively bridged in this way. We are not able to make one set of abstractions fit nicely into another, in such wise that a philosophy of high solidarity results. Even certain sciences which seem to do so reveal under critical analysis great chasms and faults. In any case, however, the genuine union of the sciences will require a modification of those outstanding conceptions which now, in order to furnish greater distinctness, have been made harsh in their antagonisms toward other elements in the scheme of truth. In any case, that is, a transvaluation of scientific values must be effected, even if it be carried out by the sciences themselves as they approach completion.

Philosophy has long asserted its claim to exercise an especially significant function in the work of unifying the sciences, although this claim is often rejected by the scientist. Philosophy performs this function by pointing out the central fact in the nature of scientific synthesis, the fact that it is a synthesis within conscious experience, and that all concept building is therefore relative to the unity of experience. Philosophy also aids the mental sciences to establish their relative rights,

which would otherwise be jeopardized by the more objective sciences. But the main significance of philosophy, after all, in the matter of a synthesis of the sciences, is its demonstration of the limitations of inadequate and one-sided conceptions. In this field it has special power, and the rigor and keenness of its dialectic surpass anything which science is accustomed to bring to bear in this interest.

The defect of the work of philosophy is apparent at once: it is not strongly constructive. It can furnish nothing but an ideal of synthesis, a conception of truth and system. Beyond that its function is purely that of the police power. Philosophy by itself can throw little light upon any of the more concrete problems in the synthesis of the sciences. The genuine principles of the theory of knowledge are compatible with any genuine knowledge whatever, and do not reinforce this doctrine rather than that, so long as both doctrines are properly drawn. In short, a philosophy which has maintained as philosophy its aloofness from the special problems of science, and driven its business as the metaphysics of knowledge in general, has no language with which to discuss intelligibly the real questions of the larger meaning of the truths which are abstractly handled in science. It is too far away; it cannot descend into the details of the discussion. Not only do its students want the special training required—that may be corrected. Rather, philosophy itself, as a separate discipline, wants the language, the points of intellectual attachment, and the competence for the task. It results that philosophical criticism directed upon scientific problems too often takes the form of mere faultfinding, unable to suggest a better conception in place of the one under criticism.

It is true that philosophy should leave to science the right to pursue its own course, to develop its own conceptions in a purely objective manner, independently of metaphysical theory. The value of the separation of philosophy from science, for the purpose of the better handling of questions in each field, is not

to be denied, and when that separation has been made, science is to be driven as science, and not as a mixture of science and speculation. Within the field of science, then, philosophy should assert no claim to displace one conception in the interest of another which has greater speculative favor. Science may be abstract and one-sided, but it is preeminently clear, close to fact, and manageable. It should be permitted to build without interference the structure which its virtues and its methods warrant. The blending of science with philosophy sacrifices the clearness and coherency of science, and, if it is offered as a substitute to displace the body of the sciences, can yield only confusion.

At the same time, a blending of science and philosophy must be worked out; for only thus can the great intellectual problem of our time be solved. We need a synthesis of our knowledges; the extreme specialization and decentralization of our intellectual world demands correction. Science itself cannot furnish that synthesis, because of the dogmatic harshness and mutual repulsion of many of the hypostatized abstractions in terms of which it moves; although, as the scientist notes the implications of unified system within the body of knowledge which he is constructing he continually deludes himself and others with the mocking hope that a synthetic view is about to be attained by the empirical sciences as such. He has failed to note that the difficulty lies not simply in the lacunae of our knowledge, but especially in the abstractness and mutual antagonisms of the constitutive categories of our specialties. And philosophy conceived simply as the science of knowledge cannot furnish the genuine synthetic view, however important its function in that regard, because it cannot discuss in detail the structure, inward relationships, and contents of our knowledges.

Thus the call becomes urgent for such a reconstruction of our sciences as Schelling conceived under the name of speculative physics, or more broadly considered, of *Naturphilosophie*.

It should exist alongside of science, in no wise displacing it or altering the course of scientific advance. It would renounce entirely the effort at discovery which is proper to science, and would take the duly authenticated results of science without debate. It would restore, however, the relation to philosophy from which science abstracts as much as possible, and would also aim to bring into closer accord the viewpoints of the special sciences. Working from this standpoint and in this interest, it would attempt a transvaluation of scientific values, by which the abstractness of science would be overcome so far as may be, and the whole system of knowledge interpreted in conscious relation to the concrete universal which vivifies that system.

It does not admit of doubt that the results issuing from such a treatment of our knowledge will fall far short, in point of coherence and clearness, of the splendid structure of our special sciences. If proposed in place of the latter it would be chimerical and absurd, and its success in displacing them, if such a thing were conceivable, would be an almost unmitigated evil. But there remains a certain field which neither our contemporary sciences nor our contemporary philosophy properly cultivate, in which much must be done if we are to learn the larger meaning of our enormous empirical accumulations of today. The warrant for the existence of a metaphysical revaluation of the structure of physical science is purely speculative, but speculative in that better sense in which the central motive of all genuine science is speculative.

Such a *Naturphilosophie* is of course not entirely non-existent today. We have excellent philosophical criticisms and estimations of various fundamental doctrines in science. The range and meaning of atomism, for instance, has been searchingly discussed. We fail, however, in point of thorough systematic treatment over the entire field. The work is stupendous, of course, and since the downfall of the Hegelian philosophy in Germany there has been a want of confidence in

systematic effort in philosophy. The history of philosophy and epistemological criticism have absorbed the attention of such as work in this field. It is greatly to be desired, however, that men examine more carefully the nature of the problem attempted by *Naturphilosophie*, and see if it is not sound, genuine, and even insistent; and then inquire further, to see if the reasons for its relative failure a hundred years ago are such as to interpose an insuperable barrier against any success for the undertaking in the changed conditions of our modern time.

Is it not absurd to suppose that the efforts of a brilliant but erratic writer of that unscientific time, trained largely in theology and Fichtean *Wissenschaftslehre*, and writing himself out before the age of thirty under the pressure of the necessity of preparing material for his academic classes, material which was immediately published almost without change—is it not absurd that these should stand as the high water mark of the speculative treatment of natural science? And ought the imperfections and want of information and of caution which are apparent in Schelling's hastily written pages to be allowed to discredit throughout all time for fair and thoughtful men the elaboration of the problem connected with his name? No doubt the work is a difficult one, and will require the cooperation and criticism of hundreds of men, and the rich information provided by the entire mass of science rather than by one precocious brain, but in any case the problem should not be prejudiced by faulty execution on the part of its first significant student.

For not only is the problem legitimate. It is also true that the nature of the relative failure of these writers is such as to prompt to new effort. We have shown that Kant and Schelling blended good work with bad in such a way as to indicate the problem, and perhaps the general direction of the solution, but by no means to recommend the particular doctrines which they developed. We have seen, however, that the theories

which they maintained, and which have since appeared so imperfect and unsatisfactory in the light either of logical analysis or of scientific advance, were in part not legitimate or necessary consequences of their guiding principles. Idealism in philosophy does not force its devotee to such a theory of the construction of matter as that of Schelling, even though it does urge for a revaluing of physical conceptions in essentially the interest which he was serving. Much of his speculation was *ultra vires*, in the judgment even of those who respect the philosophical tribunal. Its partial annulment, then, by the higher court of subsequent philosophical opinion need create no suspicion as to the general propriety and jurisdiction of the court of *Naturphilosophie*.

It is further true that the failure of these men is only partial. The work which they founded is not *science*, it is true, and no work of similar character could ever profess to perform the function of science, at any rate while the realm of human knowledge is organized as it now is. But neither does it claim to do so. For bridging the chasm which seems to separate the theory of knowledge from the results of knowledge, however, they offered important suggestions, and the guiding principles which determined their thought can be taken into the work of philosophical reconstruction at the present day.