THE ETHERIC FORMATIVE FORCES IN COSMOS, EARTH AND MAN

A Path of Investigation into the World of the Living

by

Dr. GUENTHER WACHSMUTH

Translated from the second German Edition by
OLIN D. WANNAMAKER, NEW YORK

CONTENTS

Chapter I

FUNDAMENTALS OF A NEW THEORY OF MOTION

" Oh most wondrous righteousness of the primal Author of all motion ! "
LEONARDO DA VINCI.

IN order to form a clear conception of the essential nature of cosmic ether, it is necessary, first of all, to come to a new conception of the nature of motion, into which all the phenomena of Nature are ultimately reduced by the scientific research of recent centuries. For in regard to the nature of ether and its relation to " motion," the views of the most recent investigators are altogether at variance with one another even in the most elementary and basic questions. While Lenard, the distinguished investigator in this field, rejects the theory of an " ether continuous through space and moved as a continuum " and would substitute " ether moved not as a continuum in space," yet, on the other hand, immobility is just the one mechanical characteristic which H. A. Lorentz would still attribute to ether ; and, finally, according to Einstein, " the whole change in the conception of ether the theory of relativity brought about, consisted in taking away its last mechanical quality, namely, its immobility."* As opposed to these, Lenard now conceives, according to a report, two ethers : one at rest, a primal ether filling the whole cosmos, and another ether borne along by the heavenly bodies like the atmosphere. Thus we see that in regard to the fundamental question, *whether the ether, the ultimate something which lies at the basis of all phenomena, moves or does not move*, the views of the most noted investigators are widely separated.

Therefore, we must first of all seek to establish clearly and fundamentally the true nature of motion in the natural world. In order to take as our point of departure something actual, which may be a part of the daily experience of every man—always the best standpoint from which to approach such a problem—let us consider a motion-phenomenon of man's own body and originated by himself : for example, the raising of my arm. Here, first of all, three elements yield themselves to observation.

* Sidelights on Ether and Relativity, London, 1922, p. 11.

1. An ego ; that is, something possessed of spiritual being which wills to raise the arm.

2. A medium, which conducts the volition of the will to that which is to move—the arm. That this must be present, and is not identical with the will, or the ego or the possible bearer of the ego, can be shown by stimulating the appropriate nerve centre, through an influence introduced from without, whereupon the result will be, likewise, the motion of the arm.

3. That which is moved—the arm. This alone can I perceive with the physical senses.

One who adheres to the modern quantitative-mechanical world conception will say, however, at this point: The first element belongs to the field of metaphysics, and does not concern me ; the second is—presumptively—an electric (or etheric) force ; the third is a " material body," which undergoes a change of place, a motion, that may be quantitatively-mechanically determined.

Now, what conception or understanding of this *indivisible entity, the motion of my arm, is* possessed by the observer who restricts himself to what is quantitative-mechanical and perceptible to the senses ? Really only one-third, so to speak, of the totality of facts which, however, only when all combined together comprise unitedly the reality " the motion of the arm." And this one-third is the change of place on the part of a previously unmoved body. Although I can, in fact, grasp this third, up to a certain point, in quantitative-mechanical fashion, yet my thinking becomes false and arbitrary the moment that I undertake to grasp in this way the second and the first third of the entity under observation—that is, when I carry over my conception of motion, a change of place on the part of a body, into the remainder of this phenomenon, which is not perceptible to the senses, and would understand this also as solely a change of place, quantitatively-mechanically explicable—that is, as motion. Because the physically perceptible time-and-space process of change of place on the part of the arm can be quantitatively-mechanically understood, modern science now seeks to explain also in quantitative-mechanical fashion the fundamental underlying electric-etheric process. And this brings us to the important question which Dr. Rudolf Steiner has expressed as follows* : " Whether there does not lie at the basis of the various natural phenomena, light, heat, electricity, etc., one and the same form of motion in the ether ? Hertz had already shown that the same law governs the propagation in space of the action of electricity and that of light. From this we may

* Rudolf Steiner : E.G.N.S., p. 230.

conclude that the waves which are the bearers of light lie also at the basis of electricity. It had, indeed, already been assumed that in the spectrum of sunlight only one kind of wave motion is active, which will produce the effects of heat, light, or chemical action according as it strikes reagents sensitive to heat, light, or chemical action. But this is clear a priori: When we seek to discover *what happens in that which is extended in space while the entities under consideration are being transmitted therein, we must conclude that it is always a uniform motion. For a medium in which motion alone is possible must react to everything by way of motion.* And all the kinds of transmission which it must perform will be carried out by way of motion. When, therefore, I seek to discover the forms of this motion, then I shall not *learn what the thing is which is transmitted,* but only in what manner it is conveyed to me. It is sheer nonsense to say that heat and light are motion. *Motion is merely the reaction of matter capable of motion to the action of heat and light.*"

All, therefore, that we learn when we carry over the quantitative-mechanical method of observation into the field of electric-etheric phenomena is always merely the reaction of the substance capable of motion to the action of heat, light, tone, etc. The real nature of these entities, which consists, not only in motion, but also in other qualities not perceptible to the physical senses, can never be learned by applying to these entities mechanical-mathematical conceptions.

The physicist will, of course, say: "My measurements and observations show me that the measurable and calculable part of the motion-phenomenon in the propagation of sound can be represented by means of certain mathematical equations. The state of motion in the medium conveying the sound—in this case, essentially the air—is determined by certain quite definite numerical values of the constants found in the equations, and in such a manner, indeed, that a quite definite quality of the tone conveyed is co-ordinate and indeed identical in significance with each value of these constants. When the numbers are given, the tone-state is known." There can be no doubt that contemporary physics, in the sense of its ideal here expressed, considers the essential nature of tone to be calculable because it believes that it has succeeded in the case of a part of the tone-qualities in calculating and measuring the mathematical relationships and numerical values of the constants. But the assumption that the totality of the tone-phenomenon must be calculable is merely an assumption based upon the wish to be able to calculate everything everywhere in the world and then to read mechanically, from the scheme thus attained, what is occurring. The fruit of these acoustics is the gramophone. One gets no nearer to the real nature of tone through calculating the state of motion of the tone-conveying

medium than one gets to the nature of a man when one knows the number of steps he takes in a day or how many kilograms of nutriment he assimilates. These numbers are useful and necessary to know for certain purposes, only it is fallacious to consider everything calculable. Moreover, whoever knows the form of these calculations knows that they are far from being certain and clear. Only the layman is inclined from what he reads in the newspapers and popular magazines about mathematical calculations to draw the conclusion that all occurrences are calculable. The real investigator was—at least, at an earlier period—far from the illusion that even an essential part of the world-event is calculable. Only because of the justifiable enthusiasm over the undoubted results in those fields where mathematics really apply to the phenomena has the hasty conclusion been drawn that everything must be calculable. When, on the other hand, the physicist or any sort of calculating scientist says that only what he can calculate and what is subject to calculation belongs at all to science ; that everything else may, indeed, be interesting but affords no certitude, and only where certitude is present by reason of calculations is there science,—to such a point of view we may reply that such a scientist thereby declines to grapple with the greater part of the world-content, and that he simply ignores this part of the world-content through his assertion that it cannot be scientifically approached.

In order more completely to clear up this question, we must here consider more thoroughly the " capacity of fixity," the conception of the "inert" body—the opposite, that is, of motion. Steiner says this is generally defined in physics as follows : " A body cannot alter its existing state of motion apart from a cause operating from without. This definition gives rise to the impression that the concept of a body in itself inert had been drawn out of the phenomenal world ; and Mill, who does not himself go into the question at all but turns everything upside down in the interest of a forced theory, does not hesitate a moment likewise to explain the matter in this way. Yet this is all quite false. The concept of an inert body is a purely conceptual construction. For, if I call that which is extended in space ' a body,' I can conceive *two sorts of bodies : those in which changes are brought about by outside influences, and those in which changes occur from an impulse of the bodies themselves.* If, now, I find in the outer world something which corresponds to the concept I have formed—' a body which cannot alter apart from an impulse coming from without '—then I call this thing inert, or subject to the law of the property of fixity. My concepts are thus not taken arbitrarily from the sense-world, but freely formed as ideas, and only through their help do I find myself rightly adjusted to the sense-world. The definition above

can only read : A body which cannot of itself alter its state of motion is called inert."*

I must, therefore, distinguish between bodies which can *of themselves* alter their state of motion, and those which cannot do this of themselves. And this brings us to one of the most essential distinctions in Nature : that between *the organic* and *the inorganic*.

While inorganic Nature cannot of itself alter its state of motion, organic nature, on the other hand, by reason of its inherent possibilities, is able to do this of itself ; however much this capacity varies in the most widely separated degrees from men to plants, yet it actually resides always in that which is organic. Now that which causes a carnation, for example, to grow always and absolutely from the seed of a carnation, and never any other plant whatsoever, that which induces this movement of growth, is not something which I introduce from without into the seed but something which resides within it by its own nature. The objection may be raised that the seed must be buried in the earth in order to become a carnation and does, therefore, require a push from without. Such a thought, however, would be false, for " I cannot say this influence from without produces this effect, but only that *to this definite influence from without the inner active principle responds in this definite fashion. What happens is the result of an inner conformity to law.*"† Whatever may be the character of the external stimulus, the inner active principle in the seed of a carnation will, if it works at all, respond always only with a carnation. When Haeckel wrote in reference to a similar process in the lower orders of the animal kingdom : " In the case of more than four thousand species of radiolaria which I have described, every single species is distinguished by a special form of skeleton ; the production of this specific skeleton, often of a highly evolved form, by means of a cell of extremely simple form (generally globular) is intelligible only when we ascribe to the formative plasma the capacity of forming a concept," in such a statement Haeckel may be going, perhaps, beyond due bounds because of attachment to his own theory, yet he was forced to assume in the primitive globular cell an inner active principle of its being which first manifests itself in the completely developed animal, and which, in so far as it expresses itself in the movement of growth, belongs to that extent to the category of motion-phenomena, like any other sort of motion. In the case of all these phenomena, we have to do every time with a thoroughly objective set of facts, which, when we would comprehend them as merely quantitative-mechanical motion-phenomena, we thereby immediately fail to grasp in the innermost essence of their being.

* E.G.N.S., p. 204. † E.G.N.S., p. 143.

If I assume a formative power in the seed or in the primitive germ-cell, then I must also conceive this power as being united with the " idea," with the " will," to become a carnation—or to become the animal in question—just as with the capacity for motion and change of motion. The former cannot be separated from the latter by any arbitrariness of thought. This is the case in all organic processes—that is, universally wherever there is " life " ; and, if modern science continues to place the restriction upon itself of understanding nature only mechanically and quantitatively, then it must restrict itself to the investigation of the lifeless, of the mineral. For this such a world-conception is supposed to suffice—but even for this it does not really suffice, as we shall later show. So that even Lenard, although he holds to the atomic and mechanical conception of the world as being indispensable for modern natural sciences, is forced to confess : " When, however, tens of thousands and hundreds of thousands of atoms form a molecule, so that this is a highly complex little world in itself, as for instance it must be in a molecule of protoplasm, the molecules may then enclose within themselves that which we call spirit. They then become the bearers of the *wonderful phenomena of life, which the scientist of our day, with his conceptions which in other ways serve him so marvellously, is entirely unable to explain.*"

But does not, then, the restriction of our world conception to that which is mechanical-quantitative and perceptible to the senses involve also restricting ourselves to agnosticism, to *ignorabimus*, for ever ?

And are there, after all, anywhere in Nature motion-phenomena which, when explained consistently on the basis of the quantitative-mechanical view, can be fully comprehended ? " Since, without the existence of forces, the parts of hypothetical matter would never begin to move, therefore the modern natural-scientists assume force also as one of the elements by means of which they explain the world, and Du Bois Reymond says : ' The understanding of Nature consists in reducing changes in the corporeal world to motions of atoms, brought about by their central forces independent of time : or, in other words, the resolution of the phenomena of Nature into the mechanics of atoms.' Through the introduction of the concept of force, mathematics goes over into mechanics."*

In every motion, therefore, according to this conception, there is an expression of a force. But, in that case, every motion-phenomenon has also two aspects. In so far as it is perceptible to my senses, I can up to a certain point conceive it quantitatively ; but, in so far as it is the operation of force, I can neither perceive it through the physical senses nor determine it fully through quantitative measurement, since

*E.G.N.S., p. 235.

I can never measure force in itself but always only in its physical effects. But, then, do force and motion stand in relationship to each other only as cause and effect?

They do not. In every motion-phenomenon, we have to do with the following indivisible totality:—That which is moved, which we perceive in the phenomenal world; through this we become aware, at the same time, of something not perceptible to our senses—a force?—, which expresses or manifests itself in that which is moved. The entire phenomenon—in the case, for example, of a man who moves his arm—is clearly linked up with phenomena of consciousness. Now, as man is a single indivisible entity, I learn nothing essential in regard to the motion of an arm if I only establish quantitatively the change of place on the part of the "material" arm; what I thus learn has to do only with the nature of the motion of a lifeless arm, which, however, would not of itself have performed this movement! I can, therefore, understand the nature of this motion-phenomenon as a whole only when I view that which is moved and the action of the force there manifested—linked up with phenomena of consciousness—as a unity, and not arbitrarily separate these. If I divide this unity by considering alone the process which is quantitative and perceptible to the senses, I not only separate cause and effect, but I part from one another real Being and phenomenon. Since the phenomenon is only an externalization in a form perceptible to the physical senses of the spiritual entity there coming to expression, of the real Being—that is, of an individual reality—and is not to be separated from this Being, therefore when I consider alone the quantitative, measurable process I am dealing with an unreality in the fullest sense of the term.

Is it otherwise in the case of animal, plant, and mineral?

We can readily take the right attitude toward this question if at this point we divide into the following categories the totality of motion-phenomena occurring in the world.

1. *Motions in which there comes to clear manifestation the action of a self-conscious being*, the bearer of a will (for example, a man who wills to move his arm and carries out this volition).

2. Motions whose *ultimate inducing* cause is still unknown to the sciences of our time: motions which are not produced by a man or not subject to his will;

(*a*) in the organic world,

(*b*) in the inorganic world.

We can, therefore, divide the *totality of motion-phenomena in the cosmos into those in regard to which we can know directly through the perception of our physical senses the being from whose "will" they have taken*

their origin (for example, man) : and those motion-phenomena in the case of which the primary stimulus to motion escapes our view ; that is, those in the case of which we do not know the being out of whose will the motion took its origin.

If we conceive of life—that is, of the expressions of life in the organic world—as a totality of self-metamorphosing motion-phenomena (motion of growth, motion of metabolism . . .), then he who is determined at all costs to understand the world mechanically takes upon himself the task, already shown to be impossible, of understanding as mere mechanics the phenomena of life. He must either resign himself and give up any understanding, or else he must say to himself that in the inner active principle which always causes the seed of a carnation to become a carnation a "will to become a carnation" finds expression,—a will which I simply cannot measure, weigh, or define by other mechanical means. But this "will to become a carnation," which brings the being of the carnation over into the phenomenal world, is inseparably linked as an attribute to the inner active principle, that force-complex, through which the seed of the carnation grows into a carnation,—that, therefore, which causes and determines the entire motion-phenomenon, both quantitatively and also qualitatively. As we have already said, the forces of the surrounding soil are certainly helpers in this process, but the individual impulse, that of becoming a carnation, is something which resides only within the seed of the carnation, and—unless we are to believe the absurd and naïve theory of preformation—is to be understood only when we view the force-complex residing in all seeds of carnations (etheric force-complex, we shall see) together with the "will to become a carnation" as the spiritual attribute inseparably linked to the seed. (We shall take up this process in concrete fashion in connection with our discussion of Mendelism, etc., Chap. XI.)

Yet an essential difference distinguishes this sort of motion, of course, from those considered in connection with man. The individual will of my own ego occasions the motion of my arm, producing the motion by means of the material body, the arm, through the medium of the electric-etheric forces residing in my organism. In the case of plants, however, a group-will controls, a will which induces in a multitude, a group, of bodies of a similar kind a like motion-phenomenon : the motion of growing into carnations, and this likewise through the medium of (etheric) forces. As we shall later see (Chaps. III and XI), this act of will is not free, as in the case of man, but the activity of the earth organism is linked with it in a causal way ; yet it is not determined in its individuality, in the character of its being, by the earth organism—otherwise all plants would be alike—but is influenced in its own action

only as to local modifications, and as to point of time, etc. We shall observe this action in detail in connection with a discussion of the phenomena of the force-currents of earth and atmosphere. That riddle of the ascent of water in plants during the spring will then be possible of interpretation on the basis of this reciprocal play of etheric forces in plants and the earth organism.

We have, then, in the case of man, seen the individual volition as cause and as accompanying phenomenon of the action of electric-etheric force, and thus as inducing cause of a motion-phenomenon in substance (the arm); but in the case of the plant, we have seen the group-will as uniform inducing cause of a motion-phenomenon, likewise wrought through etheric forces—that is, of the movement of growth.

In considering motion-phenomena in the inorganic as a whole, which to superficial observation appear most readily understood, we must, nevertheless, by means of more exact investigation, penetrate as far as possible toward the ultimate cause of such motions. For, whereas movement carried out or induced by the will of a man brings directly before our eyes the inducing cause of this movement in the human individual, and while, in the case of organic Nature, we can observe—though chiefly in individual instances of its effect in the phenomenal world—that inner principle of action which expresses itself in the growth, etc., we come in the case of the movements of the inorganic—those not induced by human will—upon that " regressus ad infinitum," which finds its expression in the second of the seven world riddles enumerated by the distinguished natural-scientist Du Bois Reymond in his " Grenzen der Naturerkenntnis " : *The question of the primal cause of all motion!*

For, if we have already distinguished between such bodies as can of themselves alter their state of motion (the organic) and such as cannot do this (the inorganic), then, in the case of the latter, if we would discover the ultimate first cause of a movement, we must simply follow back the " regressus ad infinitum " to the very beginning of the world. For the flowing water of a brook, a stone rolling down hill, tending toward the central point of the earth, the wind which moves the leaves, etc., etc.,—all these are only partial expressions of phenomena of the atmosphere, of atmospheric electricity, of meteorology, of earth magnetism, etc., and these phenomena are in turn only partial movements in the totality of the life-process of the earth organism. But this life-process, too, in all its phenomena of life—that is, in everything which is life and motion, not death and immobility—is induced here by the sun, as the science of our day shows. If one continues logically and asks then about the inducing cause of the sun motions, he comes at once to the question of the primal origin of motion—and as to this we will briefly explain our view.

Modern natural science wrongly places at the beginning of all that happens in the cosmos the primal nebula, according to the modified Kant-Laplace theory; and at the end, the heat-death of the entire cosmos, that vast graveyard, into which the scientist, thinking out his law of entropy bravely and logically to the end, allows the world to subside. Between primal nebula and heat-death, according to the view of *modern science, lies all that play which comprises the becoming and the passing away of universe, earth, and man.*

The great physicist and discoverer, Professor W. Nernst, says in his work "Das Weltgebäude im Lichte der neueren Forschung,"* p. 13: "Neither Kant nor Laplace could have realized that their theories of the formation of the world necessarily pre-supposed a limited duration of all events; otherwise they themselves would certainly have denied the universal applicability of their views. It remained for the evolution of the theory of heat,with that sort of assurance which applies to the universe in general a conclusion drawn from the laboratory, to draw the conclusion mentioned above—one certainly unpleasant in the highest degree. It was the famous English physicist Lord Kelvin who first pointed out that, according to the theory of heat set up by Carnot and Clausius, the whole store of force in the world would gradually but surely be metamorphosed into heat, and that just as certainly all existing heat would come to the same temperature. But the world is thereby doomed to eternal rest. The application of the theory of heat—the most universal and reliable of all the theories we possess—to the Kant-Laplace ideas causes the gruesome thought to appear in the background of our minds that the world is striving to bring itself to the state of an eternal graveyard. This is generally expressed by saying that the universe is unescapably doomed to a heat-death." And all who possess religious feeling and who seek for a meaning in human life will sympathize with Professor Nernst as he relates how he reacted as a student to the introduction of this terrible deduction of modern science by a professor of the Vienna Academy in his inaugural lecture. "He remarked, among other things, that all endeavours to save the universe from the heat-death had been futile, and that he also would make no such effort. This passage, which I read as a student, made the deepest impression on me, and my attention has ever since been directed to the matter, to discover whether some way of escape might not appear."

We also ask, therefore: Where is the weak spot in this structure of theory? Dr. Rudolf Steiner answers this question in the following picture:

When the teacher would make clear to the school children the origin

* Berlin, 1921.

of the world-system and its motions, according to the Kant-Laplace theory of the world, he performs this by means of a drop of oil, floating upon water, which—when set in rotation—throws off tiny particles of oil, which, rotating in turn, circle round the central drop of oil. But in connection with this little world-system he forgets always to mention the ultimate essential of the whole process, and the failure to mention this is the weak spot in the mechanical idea of the world on the grand scale. That is, he forgets to call the attention of the children to the fact that he—the teacher—has all the time by his own will been whirling the central oil drop. If he had not done this, his little world system would either never have come into existence or else would come to a state of rest. Moreover, even though he continues to whirl the central oil drop, the other oil drops do not continue for that duration in motion. And so he generally forgets himself, the most important factor in the whole process. He has set the central oil drop in motion, he keeps it in motion, and, if he wishes to keep his little world system as a whole in continuous motion, he must not only continue the whirling motion of the central drop, but he must so multiply himself that there shall be connected with each of the separated oil drops one " who whirls " : that is, who keeps them in steady motion.

But just such a blunder we make in the mechanical idea of the world belonging to modern natural science. This is often not only a certain forgetfulness, but also concealed indolence. For the mechanical idea of the world becomes endlessly complicated if I am required to demonstrate not only that something moves and how it moves (this is really never the main problem of science but merely its working tools), but also in dealing with a motion-phenomenon—that is, if I am to understand it, not merely piecemeal and falsely, but rightly and as a whole—must also answer this question : Through what operative principle is this motion induced ? *What will gave the initial push resulting in this motion, and with what phenomena of consciousness is this act of will united ?*

If we are dealing, for example, with the fact of the setting in motion of the primal nebula, out of which our cosmos is supposed to have come into existence, and if we do not play the part of an ostrich, but admit with logically exact thought the fact that at the basis of this first motion there must have been an *impulse of will, or a multitude of such impulses,* and that these expressions of will were also undoubtedly linked up with phenomena of consciousness, into which we cannot, of course, think ourselves with our present normal objective consciousness, then a twofold question is forced upon us :

1. *With what phenomena of consciousness are even yet linked up*

those operations of force in the cosmos and the motion-phenomena induced by them which do not receive their initial impulse from a human ego?

2. *Are there scientifically exact methods for the investigation of other states of consciousness than that of the normal objective human consciousness of our century?*

The answer to the first question leads to a complete revolution in the mechanical study of Nature characteristic of our time, a method deriving from the theory of " the limitation of the knowledge of Nature " —that is, it brings us to a science of Nature which considers not only the phenomenal world with its phenomena of motion, which as such cannot be understood at all, but also includes in the scope of its research the real being of things which come to living expression in the phenomenal world,—a science of Nature which strives to know and to understand the spiritual, the real, that which comes to active living expression in the working, weaving world of forces.

For such an inquiry into the world, the best guide and surest means of knowledge is the world ether, the etheric.

For such an inquiry, the " spirit " is not something which can be " imprisoned " within a molecule of protoplasm, or—as modern scientific materialism supposes—something which has first come into existence out of the world of substance. On the contrary, for such an inquiry, the spirit is primary, and the metamorphosing moving substance is secondary—created, maintained, shaped, and evolved by the spirit, as one of its manifestations, its phenomenal form, which it can and will again dissolve, when the spirit, as active principle working in substance, shall have brought this from the imperfect to the perfect.

The spiritual, the real, is also continuously now the ultimate cause of all motion: that is, of all life in the cosmos.

For such an inquiry into the world, there is no abstract creation of a primal nebula set in motion in a manner impossible to conceive, but, on the other hand, the involution and evolution of a spiritual activity in the world of substance ; a spiritual, a real, however, which was present before there was substance, and will persist after the end of substance (see also pp. 105-115).

The second question stated above, in regard to the development of a human capacity to perceive this world, has been answered in the numerous writings of Dr. Rudolf Steiner in which the way is shown whereby, through the most exact methods, human inquiry concerning the physically perceptible, and as such unintelligible, world of substance can be extended beyond into a direct supersensible view, clearly conscious, of the forces working in this world, the forces of the etheric, and of the spiritual therewith united.

But we should once more emphasize here the fact that even one who is not yet willing himself to take this path may, none the less, test by application to the world of experience what follows in regard to the nature of ether, at least as a legitimate "hypothesis" in the sense explained above—indeed, more legitimate than those of the mechanical world-view; and that he will find the theory not only confirmed but also rendering possible the clarification of many hitherto unintelligible phenomena.

Let us turn back once more to a consideration of the real and the phenomenal in motion-phenomena of the various realms of Nature. That which has a living expression in the human arm set in motion is a "will," something real, spiritual, therefore, which comes to living expression in the world of phenomena; in this instance, in the motion of the arm. But other natural phenomena also—the flying pollen of flowers, the falling stone—are always manifestations of an invisible world of forces, whose ultimate first impulse we do not at present know, a supersensible, spiritual, ideal impulse operative in these single events in the phenomenal world. Plato spoke in this sense, out of a primal oriental mystery-wisdom, of a world of ideas. The spiritual, then, the idea—is "not only present and active, where it is consciously known—in man, but also in another form in the realm of Nature. It is not only present in the subject, but is the principle of the objective world."* Eduard von Hartmann conceives of the idea, the spiritual, the real, on the one hand, and the will on the other, as two constitutive world principles standing side by side; and he looks upon the idea as being at rest, and as requiring, in order to come into activity, the impulse of the will. Steiner shows, in contrast to Hartmann, that these two cannot be separated: "Will without idea would be nothing. The same cannot be said of the idea, for activity is an element of the idea, while the idea is a self-sustaining being."

The world in endless motion, as perceptible to our senses, is, therefore, a manifestation of the ideal world which is in ceaseless action, of the real world of spirit.

Steiner formulates thus the fundamental perception: "Will is the idea itself conceived as force." Then we must not only desire to know the action of forces in the phenomenal world in their quantitative and mechanical aspect, but we must seek to understand the forces working in Nature as linked up with the qualitative attributes of the spiritual entities acting through these. The distinction here between man and the rest of the realm of Nature is this: That in man the spiritual, the will, when it comes to living expression as the inducing cause of

* E.G.N.S., p. 174.

manifestations of force in the phenomenal world, is linked up with phenomena of consciousness to which we ourselves are alive, since, not only does the spiritual as objective active world-principle manifest itself in man, but man himself *is* a separated part of this objective active world principle. "Freedom," therefore, belongs to him alone, in contrast with the rest of the realms of Nature given to our perception, since the rest of Nature is only an object of this spiritual activity.

Nevertheless, a spiritual, supersensible, rules in all the phenomena of Nature,—in the will of the man who moves his arm, in the controlling active principle in the seed as "will to become a carnation," in the falling stone as "will to carry it to the centre of the earth"; in the content of all these perceptions the real comes to living expression in the phenomenal.

In opposition to those who have proclaimed with premature satisfaction the purely mechanical idea of the world, a few great investigators have from time to time pointed warningly to the weak spot in this mechanical idea of the world so dogmatically asserted. Thus in reference to the science of the inorganic the famous physicist Nernst, in his endeavour to explain the process of chemical changes in substances on the basis of the physical forces working in these, has been forced to resign himself to this declaration*: "The final aim of the doctrine of affinity must be to ascribe the causes of material changes to well investigated physical phenomena. The question of the nature of the forces which come into play in the chemical union or decomposition of substances was discussed long before a scientific chemistry existed. The Greek philosophers themselves spoke of the 'love and hate' of atoms as the causes of the changes of matter; and our knowledge of the nature of chemical forces had not advanced very much until quite recently. We retained anthropomorphic views like the ancients, changing the names only, and seeking the cause of chemical changes in the changing affinity of the atoms."

So far goes the physicist and discoverer Nernst. As to the science of the organic, the investigator of organisms, Oskar Hertwig, in his comprehensive book "Das Werden der Organismen,"† sketches the following picture: "Laplace imagined a mind capable of analyzing the whole world-process into the motions of masses mutually attracting and repelling one another, of expressing this analysis in a stupendous mathematical formula, and of calculating the past and the future of the world-process. In like manner let us imagine a spirit whose power of vision so far surpasses that of us ordinary men that he could perceive the tiniest units

* W. Nernst, Theoretical Chemistry, London, 1923, p. 517.
† Jena, 1916, p. 38.

of substance, the atoms or the elements, and could follow their motions. Endowed with such divine power of vision, he would be capable of actually seeing the building up of all sorts of molecules out of the atoms variously grouped—as the chemist seeks to set these forth symbolically in his structural formulæ—though seeing the process, perhaps, as somewhat different from that which the chemist supposes. . . . For a spirit of such power of vision, chemistry would have become in reality a morphological science ; his eyes, as it were, analyse or dissect molecules into their ultimate elements and obtain a direct view into the atomic morphology of substances. Such a morphologist has actually reached the goal of the mechanistic school. To him the cell is no longer the elementary living organism endowed with structure, but has become a wonderful microcosm of countless molecules. Just as, in cosmic space, the heavenly bodies, held together in solar systems, move in well defined orbits, so would he see the molecules in the microcosm of the cell held together, according to their affinities in smaller or larger groups ; he would perceive, finally, how still more extensive groupings give rise to the forms of substance perceptible to ordinary human vision, which we call protoplasmic threads, granules, centrosomes, trophoplasts, chromosomes, spindle fibres, nucleoli. Although this picture of a future morphology, which would also include contemporary chemistry—thus becoming an all-embracing science of substance—is merely a vain phantasy, in any case the ultimate goal of knowledge would never be reached by this path. For, according to physical theories, even the atom also would have to be conceived in turn as a world of alpha corpuscles. And also chemistry which should seek to replace, by means of chemical knowledge, that which we have learned of the organization of the world of living bodies, would find itself in the same situation."

Thus, equally for the inorganic and the organic, distinguished experts in modern science have in turn pointed out the narrow boundaries of our present-day research into Nature. When Hertwig says that a morphologist who, by means of vision assumed to be his, sees through the play of forces in the world has " reached the goal of the mechanistic school," I might reply to him—and he would agree : But such a morphologist would certainly no longer belong to the mechanistic school, because in the action of the formative forces in the world of substance he would experience the impulses of spiritual entities, and because the world would appear to him, not as a mechanical apparatus of substance, but as a living organism, guided continuously by the spiritual, and striving through all its phenomena of motion toward the goal.

Just as a man—even the merely physical human body—cannot possibly be understood by studying a corpse, no more can any phenomenon

of motion belonging to the phenomenal world be understood apart from the spiritual entities which impel it. And, just as the world of phenomena—this has been shown by the most recent investigations, not only in the realm of the living, but elsewhere also—can either not be understood at all, by means of the quantitative-mechanical method, or else understood only in one small section, arbitrarily selected and by no means the most essential, so also, when we enter the world of forces, of the etheric, we shall not only be unable to understand anything by means of the quantitative-mechanical method abstracted from the phenomenal world, but shall thereby render the confusion in our conceptions of these entities only the greater.

The ether of the general theory of relativity also, which, as Einstein says,* is a "medium void of all mechanical and kinematical qualities, but which helps to determine mechanical (and electro-magnetic) events,"† and which "cannot be thought of as endowed with the quality characteristic of ponderable media, as consisting of parts which may be tracked through time"‡ to which "the idea of motion may not be applied," and yet which must have the capacity to determine the "configurative possibilities of solid bodies as well as the gravitational field,"§ etc.—such an ether has, to be sure, the advantage of being stripped of many false attributes of the mechanistic ether, and yet it gives no full picture of reality.

Ether—or, more correctly, the etheric primal forces, formative forces—as they lie at the basis of what herein follows, and as they correspond with reality, do not belong, as such, immediately to the world of phenomena, and they are, therefore, like all forces, imperceptible to the physical senses; they belong to a supersensible set of facts. But, then, as such, they are to be understood only when we consciously bear in mind in our investigation concerning them that something real, the very beings of things, comes with these forces to living expression in the phenomenal world. The ether—or the etheric primal forces, for there are several as will be shown in the following pages—are, therefore, neither to be understood merely mechanically—as with Lenard and others—nor simply by the negation of all mechanical characteristics, as with Einstein. But, when, as supersensible active principles, they come to living expression in the phenomenal world, they call forth, in this world perceptible to the senses, phenomena of motion, etc., which may, then, only partially and up to a certain point, be considered mechanically. The etheric formative forces, however, are, in

* A. Einstein, Sidelights on Relativity. I., Ether and Relativity, London, Methuen, 1922.

† p. 19. ‡ p. 24. § p. 20.

themselves, inseparably linked up with spiritual, and therefore qualitative, characteristics—indeed, in the last analysis with that which is individually spiritual. That is, we must ascribe to them, not only such characteristics as velocity, mass, length, volume, etc., which are measurable and calculable, but also characteristics whose laws in the last analysis can just as little be exhausted through numerical estimates as the characteristics of a living man can be exhausted by a table of constants and a sum of mathematical formulæ. We shall be able, therefore, to form a conception of them only when we observe and investigate them as such entities.

Chapter II

THE ETHERIC FORMATIVE FORCES

WHAT we perceive in Nature by means of our sense-organs—as every person trained in science and philosophy knows—is not in reality substances and forces but states and the changing of these into one another. "The senses inform us in regard to states. If we speak, then, of something other than states which undergo transmutations, we are no longer restricting ourselves to the bare facts of the case, but are adding concepts to these."* When we go beyond the states and their metamorphoses given to us by the senses, a twofold question then forces itself upon our thought: 1. What maintains the given states in the form in which they now exist? 2. What in given instances causes the metamorphosis from one state to another?

If we begin, not like Newton from the standpoint of matter, of the bodies, but like Goethe from that of the primary forces, we must reply to both these questions: *The etheric primal forces (formative forces). In so far as they are united with bodies in the phenomenal world, these bodies continue in that state induced by them, until such time as free etheric forces of another sort, or stronger ones of the same sort, bring about a metamorphosis of the existing state.*

We shall be able to pursue this idea in the most varied examples in Nature. But at this point we must first give a conception of the nature and the action of the etheric forces. Lenard writes: "Because of the identity of electric waves and light waves, we are sure that the same ether which brings us light, heat, and all energy from the sun also conducts the electric and magnetic forces. . . . A single ether for light, heat, and electricity—thus did Lord Kelvin express the great achievement of the electrical researches of Hertz." This error Dr. Steiner combatted as early as 1888, in the words already cited: "When we seek to discover what happens in that which is extended in space when the entities under consideration are being transmitted therein, we must conclude that it is always a motion. For a medium in which

* Rudolf Steiner: E.G.N.S.

motion alone is possible must react to everything by way of motion, and all kinds of transmission which it must perform will be carried out by way of motion. When, therefore, I seek to discover the forms of this motion, I shall not learn what the thing is which is being transmitted, but only in what manner it is conveyed to me. It is sheer nonsense to say that heat and light are motion. Motion is merely the reaction of matter capable of motion to the action of light."

The conclusions which were arrived at from the researches of Hertz, led not only to the error that from the mere effects which are produced in the ether, a medium capable only of motion, too much was concluded regarding the very nature of the ether itself, but also to the erroneous assumption that—because of the uniformity of the reaction of the perceptible medium (that is, substance) to the actions of the ether—therefore a single ether calls forth all the effects. But this error is fundamental and has blocked the way to reality before all further researches in ether.

As a matter of fact there are altogether seven etheric primal forces, formative forces, active in the cosmos; of these, however, only four reveal themselves in the space-and-time processes of our present phenomenal world. In what follows, therefore, we shall deal only with these four etheric formative forces.

Anthroposophical spiritual science designates these four kinds of ether as :—

Warmth ether,
Light ether,
Chemical ether (or sound ether) and
Life ether.

In characterizing the differences among the four kinds of ether we cannot restrict ourselves to the ascertained fact that they are distinguished in comparison with one another by the wave-lengths—that is, the degree of motion—which they call forth in the world of substance. Such merely quantitative distinctions of modern science do not at all suffice to explain the phenomena, qualitatively so utterly unlike, which the different kinds of ether produce in the world of substance. The relationship existing among the etheric formative forces is, rather, the following: The four etheric formative forces have proceeded phylogenetically one out of another, and proceed now ontogenetically one out of another; and, in reality, warmth ether has been metamorphosed—that is, has evolved into light ether; light ether into chemical ether; chemical ether into life ether. Further, the mutual relation between the etheric forces is such that the later ether, more highly evolved, always contains in itself the attributes of the earlier, yet always develops, as a new entity, an activity clearly distinguishable from that of the other.

Thus the life ether contains in itself the warmth ether, light ether, and chemical ether; the chemical ether contains the light ether and warmth ether; etc., etc. Nevertheless, each ether acts in the manner characteristic of itself alone; and only when, through having penetrated into the substance-world, it has been modified, may a higher ether, for instance, be reduced, as it were, to the action of a lower. Warmth ether, from which the other ether forces have evolved, has in turn come into being out of purely spiritual states outside of time and space. Of these we shall speak later.

The four kinds of ether may now be classified in two groups, and this distinction is of fundamental importance for the understanding of all that is to follow:—

The first two, warmth ether and light ether, have the tendency to expand, the impulse to radiate out from a given central point; they act centrifugally; whereas the other two, chemical ether and life ether, have the tendency to draw in toward a centre, the impulse to concentrate all in a given central point; their action is suctional, centripetal. This polarity of the two ether groups—the centrifugal, radiating, self-expanding will, and the suctional, centripetal will to draw inward, to concentrate—is an ultimate elemental principle lying at the bottom of all natural phenomena. This will be indicated hereafter for a great many fields of natural science.

Individually, the four ethers have the following characteristics. The etheric commences with the first state of ether, that of warmth ether. Present-day physics views "heat," not as an objective state, but only as a subjective quality called forth by a form of motion. Here also, however, the results of the theory of relativity have within a very recent period greatly modified or completely transformed many conceptions long held to be unassailable. Professor L. Graetz in his work "Der Äther und die Relativitätstheorie," which boldy denies many conceptions hitherto in constant use, thus states the problem (p. 62): "Whereas heat was considered at an earlier period to be a substance, something material, this substance theory has been abandoned since the middle of the last century, and heat and energy in general are considered as something kinetic. The second conception of the law of energy, according to the theory of relativity, conflicts with this purely kinetic theory; it conceives energy as something material. Mass is, of course, something material; and, since every change in energy is bound up with a change in mass, the theory of relativity views energy as something material, as an energy-substance, not as a motion, or at least not as motion alone. Thus it appears that energy must be conceived in the theory of relativity as energy-stuff." To future observation of

Nature, heat, embraced by such observation in its totality, will, in its essential nature, be just as objective a state as the gaseous, liquid, and solid states of aggregation in substance. "Heat" processes are a transition stage from the purely etheric to the so-called "substantial," and *vice versa* (see pp. 115-118). We shall be able to convince ourselves of this fact from many points of view in the further course of these reflections. It will be shown later on that only through the action of warmth ether do heat phenomena arise (Chap. VII), whereas the other phenomena, light, chemical processes, etc., possess quite different qualities for the reason that the etheric forces themselves which call forth these phenomena are marked by quite different qualities.

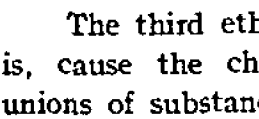
Warmth ether tends towards the *spherical* form. If it were merely a conveyer of "motion," then it could in turn call forth only motion in a substance-medium in which it works. Since, however, the tendency to create spherical forms is inseparably linked with its action, therefore it calls forth, wherever it enters into Nature and is not obstructed in its action, spherical forms. We are here dealing—and this must again and again be emphasized—not with abstract dead oscillations of unknown origin, but with concrete formative forces.

The second ether state is that of *light ether*, or, more simply, of that which is given to the physical perception of man as "light" (for details see Chaps. VII and VIII). As Lenard says, light gave us the first intimation of the existence of ether, and he thinks "Light is undoubtedly a transverse wave motion: that is, in a beam of light and perpendicular to its direction—never merely backward and forward displacements in the same direction with the beam, as is the case in sound waves—there are present periodically shifting states. Optical researches by no means recent—for instance, those in regard to polarization of light, have already shown the transverse character of light waves. In the course of time we have learned to recognize still other ether waves which are invisible: ultra-violet, ultra-red, and electric waves; but these as a group have the same characteristics as light waves, differing only in their lengths."* That the "characteristics" are similar, the lengths different, may satisfy us so long as we are testing in a one-sided and arbitrary fashion the quantitative-mechanical action in the substance-medium; but in this way we learn nothing whatever in regard to the natures and the concrete distinctions of the different kinds of ether. The light ether to which we refer, which calls forth for the human eye in the manner to be explained later the phenomenon of light, does in fact induce among other things a transverse oscillation; but in addition

* loc. cit., p. ii.

to what has been said above we must add that this occurrence describes the figure of a triangle (see below), so that light ether, as we shall see, when it can exert its effect unhindered in Nature, also produces there *triangular forms*, whereas warmth ether produces spherical forms.

We agree entirely with Lenard when he says : " We must take the characteristics of ether just as we find them in order to base these upon experience and seek to harmonize them in a conception free from contradiction ; and we must not permit ourselves to be disturbed in this—a serious error which, I think, has often been made—if we find that *these characteristics are entirely different from those of matter in solid, fluid, or gaseous forms.* For ether is simply not matter." When, however, he proceeds further, saying : " and it is legitimate for us only by way of comparison to draw upon matter at all, in order that, proceeding from our knowledge of the motions induced in matter, we may endeavour to reach a conception of the motions in ether," we must remark in regard to this, as we have already said in Chapter I, that we shall never be able to reach a true conception of ether by transferring the forms and laws of motion in matter to the ether itself. If, however, we conceive of ether, or the etheric formative forces, as formative forces void of any quality of substance, as active principles which come to living expression in the phenomenal world only through their active tendencies to definite motions, to shaping definite forms with definite qualities, then this difficulty disappears (see pp. 36-37). We may say, then, that an oscillation,

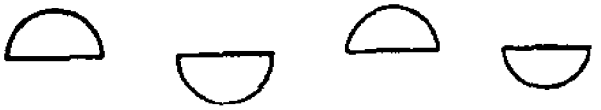


a form which is caused by light ether in a substance-medium, takes the shape of a triangle. (See also Chaps. XI, XII.)

The third ether is *chemical ether*, or *sound ether*. Its forces, that is, cause the chemical processes, differentiations, dissolutions, and unions of substances ; but also—though, as it were, through activities in another field—its forces transmit to us the tones perceptible to the senses. The inner kinship of these two spheres of action will be clear to us from the phenomenon of Chladni's sound-forms. For it is tone which causes the uniting together, the orders and forms, of substance and bodies of substance. " That which the physically audible tone produces then in the dust is happening everywhere in space. Space is interpenetrated by waves produced by the forces of chemical ether,"* which, in the manner of the Chladni dust figures, dissolve and unite substances. But chemical ether has in reality " a tone-and-sound nature of which sensible sound, or tone heard by the physical ear, is only an outward expression : that is, an expression which has passed through air as a medium."

* *Rudolf Steiner : E.G.N.S.*

We shall discuss more thoroughly in Chapter IX the origin of tones audible to the senses; here we must only establish the fact that tone and chemical processes are to be attributed to the same ether in the manner explained.

Chemical ether, when it can exert itself unhindered in Nature,  produces, as we shall be shown concretely, *half-moon* forms.

In contrast with the expansive kinds of ether—warmth and light ether—chemical ether, as we have said, tends in its action to be centripetal.

It may also be proved that the phenomenon of cold is one of those attributes which are to be ascribed to chemical ether, a fact which is essential for an understanding of the relation between processes of cold and of contraction.

The fourth ether is *life ether*. It is phylogenetically the most highly evolved ether, and therefore in its qualities most varied and complicated, as we shall later show in connection with the most varied phenomena. It is, as we shall see, that which is rayed out to us, among other things, from the sun and then modified in its action by the atmosphere of the earth in a manner to be described in the following chapters. Life ether, together with chemical ether, belongs to the group of suctional forces, those which tend to draw inwards. We shall also be able to prove its relation to that which is called "gravitation" and to the phenomenon of magnetism.

Its form-building tendency, when it can exert its effect unhindered in substance, leads to *square*  shapes, expressed, for instance, as we shall show later, in crystallizing salt.

By way of resumé then, we may say:

There comes into existence phylogenetically and ontogenetically out of the non-spatial state:

	Spatial tendency	Form tendency	State induced*
Warmth ether	Expansive or	Spherical	Heat
Evolved therefrom, Light ether	Centrifugal	Triangular	Gaseous
Evolved therefrom, Chemical ether	Suctional Drawing inward	Half-moon shaped	Fluid
Evolved therefrom, Life ether	Centripetal	Square	Solid

* See next chapter.

The States of Aggregation of Substance and the Etheric Formative Forces

We have shown that what we really see in the phenomenal world is "states and their metamorphoses into one another." These may be grouped, first of all, into the four states of aggregation: the solid, the fluid, the gaseous, and the fiery, or heat, state. That the last is in fact an objective state and not only an imaginary "motion" bringing about in the human organism the subjective heat-experience,—this we have already discussed above (see p. 23). Fearless investigators have already been compelled recently to assume a certain state beyond the gaseous and different from it, but they have not been able yet to reach a concrete conception of its nature (see Chap. III). As a matter of fact, the heat-state is present quite independently of the others, as is evident on the following grounds. If we wish to answer rightly the twofold question naturally arising: 1. What induces and maintains the different states in Nature? and 2. What preserves these or metamorphoses them one into another? the answer is that each of the four states of aggregation is brought about and maintained by one of the etheric formative forces, as follows:

The Heat state	...	...	...	by Warmth ether,
The Gaseous state		...	...	by Light ether,
The Fluid state	...	...	...	by Chemical ether,
The Solid state	...	...	...	by Life ether.