Rhythm, Turbulence and Stasis in Nature:

The Spirit-Matter Problem Revisited

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Introduction

"Productive form lies equidistant between rigidity and chaos." (Friedrich Schiller)

Modern science has made great strides towards achieving an ever clearer understanding of nature's laws. Its accomplishments in this regard are undeniable. But at the same time, science's claims to be achieving thereby an ever more absolute control over the natural world stand in sharp contrast to the reality of its attempts to achieve this control, which are fraught with unexpected consequences and undesirable side-effects. These consequences and side-effects are not limited to the resulting environmental catastrophes, but extend right into man's inner life of soul and spirit. By increasingly surrounding ourselves with the trappings of technology, we are eroding the direct contact with the natural and spiritual worlds which once made up the greatest and most fulfilling part of human life. The experience thus arises of being alienated both from the natural environment and from our own inner being (self-alienation). This then gives rise to the oft-expressed and sometimes even mystically experienced desire to re-connect with the creative spirituality of nature and/or with a higher self implicit in our own being. The naturalness of this desire's expression is as undeniable as the vagueness of the possibility of its being realized in the face of the concrete reality of the modern world.

The on-going achievements of natural science and the inner sense for a need to reconcile ourselves with nature (and with ourselves) are not irreconcilable. In fact, they depend upon each other to accomplish their ends, for science can only go beyond its present limits when it enters into nature in a new, more empathic way, while the desire to re-connect with nature can only go beyond a vague, unfulfilled wish when it can penetrate the detail of the world's 'buzzing, blooming confusion' with the help of the accomplishments of science. These steps of deepening our forces of empathy to transcend the divisions between ourselves and the outer world, on the one hand, and achieving clarity of consciousness even in the deepest and most intimate worlds of our inner experience, on the other hand, are the very steps of self-development which enable us to overcome the experience of self-alienation and to (re-)unite with our higher self.

The following is an attempt to illustrate both the inter-dependence of and the possibility for a new co-operation between these two impulses, our inner (or feeling) and our outer (or scientific) experience of the world. Through reconciling these, a new and higher synthesis can be achieved. It is a journey, or rather, the first steps of a journey. It is the author's hope that, if the goal is not yet reached, it is at least approached closely enough to become visible.

The journey begins with an investigation of certain natural phenomena, followed by a brief summary of the current scientific understanding of these phenomena. The attempt will then be made to allow this scientific understanding to grow beyond itself, largely by drawing conclusions inherent in the scientific work itself. It is the premise of this work that if science takes itself seriously enough, it can and must transcend its own boundaries.

I. Nature's Expressive Modes

The still waters of a quiet lake are eternal, unchanging. This condition of timelessness is shared by the straight-channeled stream which slowly flows from this lake, as well; though the waters of its flow are perpetually renewed, it too has an unvarying appearance which in its static character reflects a reality as deep as the changing material constituents; the stream is both ever and never again the same.

Where conditions are steady and unchanging, there is no evolution. Such stillness or smooth, unvarying flow is but one of nature's possibilities, however. Should the stream encounter an obstacle (e.g. a curve in its bed, or a rock), only the slowest moving of currents will continue uninterrupted in its stately flow, merely adjusting itself to the new direction. As the spring flows give the current more speed and strength, eventually such an obstacle will hold back too much water, and the stream will begin to rise at the place of encounter. At a certain moment, having risen high enough, it will then surge out around the rock, or off in a new direction and away, lowering the water level at this point below the surrounding stream. Then the stream will rise again, surge out and fall, rise again, surge out and fall, and so on indefinitely. The originally eternally unchanging monotony of static flow has evolved into a rhythmical expression in time.

With melting snow and spring rains, the current continues to grow in strength. At certain moments, the stream’s rhythm may become progressively more and more complex in order to absorb the energy of the increasing flow. For example, instead of the water surging around the obstacle in a more or less unified fashion, after being held back it may surge around first more to one side, then to the other side, then to the first side again, taking twice as long to complete its cycle. As the current grows sufficiently in strength, this rhythm may evolve into a yet more complex one as the stream flows first strongly to the right, then weakly to the left, then weakly to the right, then strongly to the left, and so on, taking twice as long again to complete a cycle. Ever smaller further increases of current will then be sufficient to stimulate a change to the next more complex rhythm, each time doubling the cycle period, until soon the slightest increase of the current’s strength suffices for this. Eventually, the swelling current will pass right through all the remaining rhythms, an infinite number of ever closer together doublings.[1]

The increasing current will eventually grow too great for a rhythmic resolution of its strength. The stream will now become turbulent where it meets the obstacle, turning it into a white water froth that splashes and crashes about in an ever-shifting, Protean display of form-creating prowess. Gazing at these perpetual transformations, we have the sense that there is something constant in and typical of this particular foaming mass, something which lies behind the ever-changing outer appearance. We also have the sense that we never see quite the same forms or movements twice, that no sequence ever repeats itself. The fascination which this perpetually metamorphosing foam and flow exerts is mysterious and powerful.

As described above, the stream’s development moves through three characteristic modes through which natural phenomena appear or reveal themselves: stasis, rhythm and turbulence. All natural phenomena unfold in one of these three modes, or in combinations of and/or transitions between them. Despite the fact that all three modes are inter-related and often appear in the same phenomena (e.g. a stream) at different moments or places, each mode must be approached through a radically different mode of understanding in order to do it justice. It is as if phenomena enter into a fundamentally different manifestation of their

[1] At some point, the current of a stream would increase faster than the stream takes to go through these ever-lengthening cycles, and would skip through or over them in a somewhat more complex transitional flow. Turbulence is not always approached through such period doublings, but this approach illustrates most characteristically the inter-relationship between the three modes.

being when they shift from one mode to the other.

Let us examine these archetypal qualities of stasis, rhythm and turbulence.[2]

II. Rhythm between Stasis and Turbulence

Wind and weather, tides and waves, the growing plant, the cycles of animal life: all these are natural phenomena which generally reveal themselves in flowing, living rhythms. Such rhythms surround us and are within us, often remaining unseen and unnoticed while they give our lives and that of the Earth their living breath. These living rhythms can also stagnate, however, taking on a frozen, static character, or dissolve into a turbulent chaos.

Many phenomena outside of the natural world also take on a more static, a rhythmic or a turbulent character depending on circumstances: e.g., the economy, social and political life and our own inner and outer biography. In fact, these three modes of expression are found to be interconnected in so many aspects of our experience of the world that their unity appears to be a fundamental creative principle which is experienced at various levels of reality: the physical world, society, the inner life of the human being, the outer cosmos. What determines whether any of these are static, rhythmic or turbulent at any given time? How does the one condition change or evolve into another? Understanding how natural phenomena transition from one to another of these modes of expression may stimulate some understanding of the role and interrelationship of these modes in other realms of life as well.

One of the most important discoveries of the last decades was that turbulent, rhythmic and static conditions in nature result from a tension or constantly changing balance between two fundamental kinds of physical forces or influences: those influences which tend to bring about greater activity (energizing or accelerating impulses such as gravity or the sun's heat and light) and those which tend to dissipate and reduce activity, (e.g. friction and viscosity). If the accelerating factors overwhelm the capacity of the calming factors to dissipate their energy, turbulent chaos results. If, on the other hand, the factors reducing the energy of the system absorb enough of the accelerating factors' influence, the development becomes

[2] This description of the transitions between types of flow, and this essay generally, owe a great deal to a number of researchers whose work has been gathered together under the name of 'Chaos Theory' (especially Steve Smale and David Ruelle).

monotone, static.[3] Between these two, the cessation of all evolution and the dissolution of all coherence, the creative revelation of nature unfolds in rhythmic evolutions: a realm of balance capable of quieting into the stillness of the static state or of bursting forth in turbulent, chaotic exuberance, but also of staying in or returning to the rhythmic condition. This is a significant contribution to our understanding of the natural world: that its life is a balance or play between two kinds of forces, the one energizing and destabilizing, the other quieting and rigidifying.

Nature can be seen to be attempting to achieve a balance between accelerating and dissipating influences through a rhythmic movement between the two polarities, acceleration and retardation: a rhythm which will be calmer if the calming influence is quite strong within the balance, more lively as the exciting influence becomes the stronger. Like a meandering stream, which can stagnate where it is forced to flow in a straight channel or is dammed up to a still pond, but equally loses its capacity to sustain life where it is forced into continual thrashing turbulence, all rhythmic phenomena exist in a balance between the excesses of both poles.

Turbulence: there where nature has lost its balance, either temporarily, to regain it a moment later as in the case of white water feeding back into the river's rhythmic flow, or more enduringly as in the case of the forest fire raging out of control, only ceasing when there is no more forest to be consumed. In either case, the turbulent state is inherently unstable.

Rhythm: where nature can evolve a dynamic balance. The climatic and soil conditions in which a forest grows are continually evolving in response to many factors, not least of which is the effect of the forest itself (e.g., the leaves shed onto the forest floor, the evaporation from the leaves on the tree, shadows, etc.). A mixed forest is capable of evolving to meet changing conditions by adjusting the species' balance; those more suited to the new conditions can flourish, while others decline proportionally. The balance between large trees,

[3] If only one of these influences is present or pre-dominates, phenomena develop in a relatively simple manner. If dissipating influences predominate overwhelmingly, for example, all activity simply ceases (for example, a rock rolling on level ground will come to a halt). If energizing influences predominate overwhelmingly, the activity simply accelerates steadily (e.g., an apple falling freely under the influence of gravity). If, however, they both present significant influences on the situation, phenomena move between our three characteristic modes.

undergrowth and ground cover can similarly evolve. Species not previously present will be brought by wildlife and birds and find niches as appropriate. Insect, bird and wildlife populations will similarly adjust their balance to meet the changing conditions.

Stasis: there where nature has lost its possibility to evolve or to respond creatively to changes in the environment. In an artificially planted, single species forest – say, of Douglas Fir – there is a particular beauty, but also a sterility which makes it unfit and unable to evolve in the face of changing conditions. This sterility is stasis. The channeled creek and the hybrid grain show a similar inability to evolve, a tendency to die out and an incapacity to support life.

The healthy river can flow on and on, the mixed forest can live in its cycle between growth and decay over vast periods of time. In such cases, further evolutions remain possible.

Many places where nature shows itself to be either turbulent or stagnating at times – in the weather, in natural disasters, etc. – seem to be quite rhythmic at other times. There are even indications that much of nature was once much more rhythmic than it is today, such as old farmer's rules about the weather (relating the phases of the moon to rainfall or cold winters following late hot summers, etc.), or modern scientific observations that indicate that at least certain aspects of nature are growing increasingly turbulent or moribund and less rhythmic in character.

There is a growing awareness that humanity took a much more active role in maintaining natural and social rhythms in the past. Traditions of caring for the environment (whether through the settled agricultural patterns of Europe or the nomadic but equally systematic approaches in North America or Africa) brought rhythmic influences to bear. For example, that fallen wood was systematically cleared out of forests and burnt, while mature trees were harvested for building material meant not only that massive and chaotic outbursts of forest fire were avoided, but that a rhythmic pattern of growth and burning was positively influencing the climate and weather patterns. Ceremonial customs (rain dances, etc.) also reveal the existence of a consciousness of mankind being co-responsible for the manifestations of nature, and perhaps even that a more direct influence was once possible here as well. Though we can be inspired by the past relation of human societies to the natural world, in our present, increasingly complex environment, which must absorb the effect of factory emanations, air, land and sea travel, mono-crops, etc., new and more conscious ways of understanding and positively influencing nature's patterns are certainly demanded.

We now know that nature's three modes are interrelated in such a way that phenomena can easily shift or be shifted from one condition to another: from stasis to a rhythmic unfolding, from rhythm to turbulent chaos, and back again. The delicacy of the balance of nature is thus very apparent. We must come to understand how this balance is maintained or restored in nature – and in social and individual human existence as well. An understanding of the two mutually opposed kinds of forces which are continually at work to upset this balance, each in their own direction, is needed for this.

We also must explore the contribution of a third kind of influence, largely overlooked hitherto but critical to maintaining this balance: those forces which hold phenomena together, giving them integrity as phenomena per se. The river evolves between its bed and the water's surface tension, the atmosphere in its layers. We must better understand how the forces which give each phenomenon an individual 'gestalt' or identity react and respond to the influences of the two kinds of unbalancing forces; we can then work to ensure that man's effect on nature strengthens the balancing forces, thus supporting nature's own capacity to resolve and absorb forces which disturb this balance.

This raises many questions: Under what conditions do rhythmic phenomena become turbulent or static? What influences bring these latter states back into a rhythmic flow? In what kinds of situations is nature capable of absorbing turbulent shocks and moribund states back into its healthy, rhythmic life? To what extent is nature now or was nature ever capable of accomplishing this and of sustaining its rhythmic, productive and sustaining activity independently of man's co-operation? Does man's influence on nature increase or diminish this capacity? To what extent is (and always was) man's involvement determinant as to whether nature died out, became chaotic or remained healthy? How did mankind take hold of this responsibility historically? What is the present situation? What could the future hold?

A few researchers have begun to explore these questions. Two important examples are Theodor Schwenk's sensitive studies of flow in water and John Wilkes' 'Flow-Forms', which transform static into rhythmic flow. Similarly, objective measurement of the rhythmic health of natural phenomena has been explored with considerable success through the work of Pfeiffer, Kolisko, Hauschka, etc. In all of these cases, results depended upon a sensitive approach to the phenomena being developed through untiring practice and experimentation.

From the human heart to the weather, whether rhythm is sustainable is a vital question for our health and the health of the planet. New stresses are being placed on nature's capacity to maintain its life processes. We are responsible for the new stresses. We must learn to find the laws of nature's modalities, of how and where and when it shifts from rhythm into turbulence or stasis, and how to maintain it in the middle ground where still possible, to bring it back there where it has lost its balance. This will surely demand of us not only a transformation of our outer relation to nature, but an inner transformation as well.

III. Sensitive Dependence upon Initial Conditions

Nature's movement between the three modes we have been speaking of is surprisingly complex. A small diversion will be necessary to understand how and why this is the case.

Imagine, if you will, a quite bumpy snow-covered hill, and a sledge which we would like to set in motion at the top of this hill in such a way that it will take a given course and arrive where we want it to at the bottom. Establishing such a course is quite easy to accomplish if we can find a smooth path down. If the hill is rough enough, however: if the bumps and hollows are so placed that it is not possible to find a straight path between them, our troubles begin. We quickly discover that it is virtually or even completely impossible to know where to set the sledge going in order that it will end up how and where we want it, or even to predict where it will end up starting from *any* given point.

On a bumpy slope, the direction of a sledge is shifted in a somewhat complicated and peculiar way. The problem is that a convex or concave surface, a bump or hollow, tends to spread apart nearly similar approach paths: however much the sledge's real course diverges from its predicted course at any point *before* a bump – and there will always be some slight inaccuracy here – it will diverge significantly more *after* passing over the bump. This greater divergence is then further magnified by the next bumps, increasing exponentially with each, until initial predictions as to how the sledge would be likely to be approaching the next obstacle, and perhaps even as to *which* bump or hollow it will be heading for, are likely to be hopelessly far away from the real development. The sledge is moving on a course almost impossible to predict initially.

The sledge continues downhill. A few *more* such encounters, and… well, we remember the results from our childhood. It is exhilarating to be on such an unpredictable course, of course, but impossible to repeat the same course twice; even the attempt to start at exactly the same point in exactly the same way is highly likely to result in quite a different finishing point (assuming a reasonably bumpy hill and the absence of a worn track, of course).

A very similar situation was encountered by the meteorologist Edward Lorenz while studying the principles of atmospheric movement. He was using a somewhat idealized model of how the atmospheric layers move under the warming influence of the sun's rays, which seems to be a good example of a clearly definable and predictable physical situation with relatively well-understood laws ruling its behavior. Lorenz's goal was to improve weather prediction, which had gotten rather stuck: the short-term predictions were quite good, generally; the middle- to long-term projections were not only often poor but also proving very difficult to improve.

Lorenz discovered that, even in the highly simplified model he was using, very slight variations in the initial atmospheric conditions assumed resulted in substantial changes in the projected course of the atmosphere's development. Like the encounters of the sledge with the hill's bumps and hollows, in the atmosphere each molecular interaction increases initially perhaps very slight divergences exponentially. Because of this, even a wisp of a breeze or a single molecule moving differently than assumed initially will result in the atmospheric condition developing in a way which diverges rapidly from its predicted course.[4]

As a result of this analysis, Lorenz came to the radical conclusion that the problem with weather prediction was not that an inadequate number of measuring stations were resulting in an insufficiently accurate picture of actual atmospheric conditions, nor that the theoretical models were insufficiently precise or contained inaccurate assumptions, but that even the minutest of unobservable events became multiplied in significance so rapidly, that within a relatively short period of time (days or weeks), such small-scale factors overwhelmed the larger-scale, observable factors in importance. In Lorenz's pregnant image, a butterfly flapping its wings in China could set off a tornado in Texas.

It was once assumed that if everything was known absolutely accurately about the sledge and the hill, or about every molecule of the atmosphere, it would be possible to accurately predict the future course of both of these. In reality, however, there are always unavoidable inaccuracies in our determination of atmospheric conditions, and we cannot of course measure every molecule and snowflake. Thus, there will always be minor uncertainties in our initial picture.

It had been further generally assumed that a broad picture was in any case sufficient

[4] Lorenz was unaware that the great French mathematician Poincaré had preceded him by more than half a century with a theoretical and imaginative contemplation of this very problem of weather prediction, and had deduced the precise result which Lorenz discovered experimentally through computer simulations.

and that minor influences or divergences from this would remain minor in significance. Lorenz showed that this is not the case, that the course of development can and often does depend so sensitively on the initial situation, that even the minutest of discrepancies here is sufficient to overturn even the best of predictions after a relatively modest span of time.

Thus, where sensitive dependence on initial conditions is present, two situations which are virtually indistinguishable initially will generally be following radically different evolutions a short time later, while two situations which after a given time are evolving quite similarly will generally have begun quite differently. Quite slight changes in the starting conditions will often create seemingly arbitrary and unpredictable effects. This gives the impression of a chaotic relation between the initial situation and the resulting course of events. Sensitive dependence on initial conditions is, however, quite different from turbulence, our other example of 'chaos' (though they are often found together).[5]

Sensitive dependence's importance for natural phenomena has several consequences for our understanding of the natural world. In particular, the significance of the human being for the natural world's existence and health becomes apparent. Classical science's separation of the observer and the observed phenomena has often obscured this significance.

The Human Being in a Turbulent World

Science generally studies an unmanned sledge plunging down an irregular hill, as it were. This leads to conclusions about the unpredictability and the uncontrollable nature of such a course. It is quite true that an observer at the top of the hill cannot set the sledge going under such conditions and hope to know or pre-determine where it will end up. But by sitting in the sledge, it is possible to discover the trick of shifting one's weight slightly and eventually learning to control the sledge's path quite well thereby. How is it possible to be in the middle of a turbulent development and control the outcome? Why is it different from the situation where we stand aside and try to influence the situation from the outside?

[5] Turbulence is always sensitively dependent upon not only the initial conditions, but to the conditions at every other moment as well. Sensitive dependence can occur without turbulence, however. A pencil stood as nearly as possible vertically upright on its point will eventually fall, as absolute uprightness is impossible to achieve here, and in any case infinitesimal influences (the slightest of air movements would suffice) will disturb the balance. In which direction and exactly how quickly it will begin to fall are impossible to predict, for these are sensitively dependent on the initial situation. The fall itself is no way turbulent, however, but quite orderly.

It lies in the nature of turbulence that such an influence from within is possible and not particularly difficult. The sensitive dependence of turbulent situations means that the slightest of shifts in the conditions at any moment will change the turbulent path to another, also turbulent path of development, and that this new path begins to diverge with increasing rapidity from the previous path. For either a sledge-rider or an observer, the *long-range* result of such a change is extremely difficult to predict. But the *short-range* result of such a change, at least up to the next obstacle or so, is somewhat predictable. Being able to reasonably predict the next bit of the path doesn't help an observer much when there are still many turbulent obstacles to go through. It enables the sledge rider, however, to always be able to control the short-term evolution fairly successfully. In order to best meet the immediately approaching obstacles, the sledge must be corrected again and again, both because the further consequences of choices previously made are too unpredictable and because of the incomplete control which the rider is able to exert – the sledge will never be going *quite* as desired. Thus only a continuously exerted influence, shifting the sledge from a path which would perhaps have a very different outcome from the desired one to a path which is at least somewhat closer, can accomplish anything here.

It lies in the nature of sensitive dependence that only a slight effort will generally be needed to change the situation considerably. *Practice* is needed to become familiar with how the phenomena reacts, to tune our sense of how to adjust the approach to bumps and hollows by shifting our weight properly in order to near the aim instead of ending up further away. A constant flow of such corrections as we shift from one (turbulent) path to another at will, constantly choosing the best (or at least a somewhat better) path of those accessible with a minimum of or a reasonable effort, can achieve surprisingly good results.

Every such situation or phenomena (e.g., water flow, atmospheric turbulence, etc.) demands a sort of phenomenological breakthrough in order to arrive at a conception of what is needed in order to influence the situation harmoniously. A 'feel' for the conditions and how the phenomenon reacts to changes in these must then be developed through practice: a pilot riding through air turbulence cannot use his experience of sledding directly, though the sensitivity developed by the latter skill will certainly be helpful. Each kind of turbulent phenomena is in this sense unique; the process of finding ourselves in them is similar but must be mastered anew each time. What these processes have in common is the sensitivity to sense perceptions of the natural world (through the senses of balance, movement, sight, etc.) and to the effects of our actions on nature which they demand of us.

In the situations described by conventional physics, results are proportional to the efforts made; slight shifts produce only slight divergences. These can, indeed grow over time, but they normally do so in a linear fashion. Turbulent conditions must be approached differently, because slight shifts can create radical changes in the course of development quite rapidly. The answer to nature's sensitive dependence to the environment is the human being's increasing sensitivity to nature, and the ability to live within the experience of nature rather than apart from this. One of the missed lessons of chaos theory is thus that nature already reacts sensitively, but that we must now develop a corresponding sensitivity to her life and being. Only thus can we hope to know and control where we are going.

IV. Modern Physics, Consciousness and the Existence of Spiritual Worlds

Modern science has been remarkably successful in defining the laws of causality within the physical world. It has tried to explain all appearances in the world perceptible to our outer senses as originating within that world. If, as our scientific understanding declares, every physical effect has a physical cause, then nothing outside the physical realm can have any influence on the outer, physical world without violating the clear laws of causality already present within the latter: in other words, unless there is a visible miracle. This creates a problem in understanding 'spirit' in general, and human consciousness in particular, for it implies that they are incapable of affecting the physical world. In natural science's world view, spirit and consciousness must either exist on an independent level of existence able to perceive the physical world without being able to influence it; or else these apparently spiritual realities are actually wholly determined by physical processes, a sort of foam on the top of physical reality (and can thus be ascribed no independent existence or significance). In brief, that spirit is either an impotent onlooker or a meaningless by-product of physical existence.

Scientific developments in the twentieth century – in particular the work of Heisenberg and the theory of quantum mechanics – modified this standpoint only slightly. Heisenberg showed that our capacity to measure the fine detail of the world accurately is in principle limited. This implies that the spiritual world could be exerting an influence so small that we can never measure it.[6] Quantum mechanics then showed that the outcome of certain

6 But still a finite influence. Classical physics would only allow this if the influence was infinitely

processes at sub-atomic scales are in principle indeterminate, that is, that even if all of the physical conditions are known, the outcome remains unpredictable. Thus, the possibility that it is the spiritual world which determines the result of these processes cannot be excluded.[7]

Because in both of these cases any possible non-physical influences on the physical world must be diminishingly small (immeasurable or at subatomic scales), and because in the traditional scientific understanding, such extremely small influences could not be very influential compared to the larger scale and still determinate physical reality, the importance of these theories for the problem of spirit and matter was limited. Any noticeable spiritual influence on the physical world would still represent a violation of physical laws.

Sensitive dependence on initial conditions changes all this. Seemingly insignificant or even infinitesimal influences on the conditions of sensitively dependent developments will often or generally exert an extremely significant influence on the following evolution. Where sensitive dependence is present, thus in particular in turbulent or chaotic conditions, the spiritual world has a potentially continuously open portal to influence or guide the development of the physical world. Where, in contrast, conditions are static, no such portal exists; the physical world takes its course independently of any possible spiritual influence. In the realm between, the rhythmic realm, neither the determinate physical situation nor perpetual indeterminacy dominates; both are held in balance by an ordered evolution.

Phenomena where sensitive dependence plays an important role include: waterfalls and white water; turbulent storms and air pockets; the division of cells and the moment of conception (fertilization); the neuron synapses; more generally, at moments of transition, where the old has disintegrated and the new not yet formed, where several outcomes are in the balance, where the various factors influencing the situation cannot be resolved through a static or rhythmic course of development and turbulence results. All of these are, according to the implications of our current understanding of physical events, potential portals where, should consciousness or the spiritual world work into the physical world, they could have a determining influence on the latter's development.[8]

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minute.

[7] It may be worth mentioning that the ground-breaking physicists who explored these questions were well aware of these philosophical implications for their work.

[8] It is of course also theoretically possible that indeterminate situations are *not* in fact influenced from the spiritual world, that they are simply indeterminate, chance rules, or that we cannot discover or have not yet discovered the physical principles which are at work here, and that turbulence generally is less mysterious than it

Conclusion

In order to transform our relation to nature into one of co-operation and synergy, several aspects of our understanding of and relation to her need to be deepened and transformed.

Firstly, we need to deepen our perception of nature, awakening to and familiarizing ourselves with her myriad phenomena, and to begin to understand what is characteristic in each of these. Through developing this understanding we can begin to achieve a conscious role in sensitively shaping these phenomena, and thus to contribute to their unfolding. For every phenomenon this requires a new act of imaginative perception and of practice. Significant steps towards such a deepening perception of and sensitive relation to nature have been accomplished already by researchers such as D'Arcy Thompson[9], Goethe[10], Theodor Schwenk[11], John Wilkes[12] and Paul Schatz[13]. Thus, a *phenomenology* of nature is already developing.

Secondly, we need to find the characteristic modes of manifestation that lie behind nature's manifold particular phenomena. In a sense, we need to forget the individual phenomena, moving beyond these into the quality or character of their expression. Thereby, phenomena reveal themselves as naturally belonging to fundamental phenomenological *types*, each type having a characteristic manner of manifestation. (For example, turbulence is one such type, within which nature's many individual turbulent phenomena can be grouped.) This understanding of nature's characteristic ways of revelation, and how phenomena are grouped

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seems to be in this respect. I do not wish to claim that *physical science* has in any way *proved* the existence of non-physical influences; this would be a sort of non-sequitor. But the claim which this physical science once made, to systematically *exclude* the possibility of any such influence, is no longer valid. This is in itself a radical departure.

9 D'Arcy Thompson's *On Growth and Form* is a ground-breaking study in the morphology of the plant and animal kingdoms.

10 Goethe's scientific work, which perhaps defined phenomenological science, is referred to here.

11 Theodor Schwenk's *Sensitive Chaos* is a phenomenological study of water movement without equal.

12 John Wilkes' flow forms transform a steadily flowing stream of water into a series of rhythmic flows through sensitively shaped basins. The resulting flow has some remarkable characteristics.

13 E.g., Paul Schatz's work with a particular geometric form, the oloid, and its possibilities for generating new kinds of motions in water.

within these, leads to a *typology* of nature.

Finally, we need to understand nature's underlying principles, that is, the processes that bring forth the characteristic modes and manifestations by which nature expresses herself. This requires exploring how the types or manners of expression are achieved, which leads us behind these types to the principles which give rise to them. (For example, understanding the physical principles through which turbulent phenomena actually arise, which leads then to recognizing their connection with rhythmic and static phenomena as well.) This leads to an understanding of nature's processes, a *methodology* of nature.

Through these three approaches to nature, deepening our sense perceptions to a *phenomenology*, deepening our experience of her revelations to a *typology*, deepening our understanding of her principles to a *methodology*, the human being can overcome both the dangerous consequences of the subject-object divide of *reductionist* scientific thinking and the hazy impotence of a *vague* and somewhat mystical longing to be at one with nature. A path to re-joining nature as a participator, as a conscious contributor to and co-creator of her existence, is thus laid. Though many thousands of years will certainly be required before mankind walks this path to its end, both our inner and outer development demand of us that we now begin the journey.