SYNTHESIS OF SCIENCE AND RELIGION

CRITICAL ESSAYS AND DIALOGUES

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ESSAY THREE

GOD AND THE LAWS OF PHYSICS

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Chairman, ladies and gentlemen, thank you very much for giving me this opportunity to present a few points on the relationship between spiritual ideas and the ideas of modern science. What I am going to do here is to present one tentative concrete proposal for relating these two things. This is intended as a topic for discussion and further thought, not as anything final.

1. INTRODUCTION

The rise of classical mechanics marked the culmination of a major shift in Western thinking from the Aristotelian conception of the world as an organism to the conception of the world as a clocklike mechanism operating according to mechanistic laws. The distinguishing feature of classical mechanics is the idea of determinism—the idea that the history of events for all time is rigidly determined by the precise material conditions existing at one time.

Determinism has many profound philosophical implications. For example, if nature is indeed strictly governed by such deterministic laws, then sentient beings must be pure machines, and the possibility of a nonmaterial mind that interacts with matter is ruled out. Thus, a recent book on the relation between minds and machines begins with the premise that, "the price of mind/body interaction is violation of the laws of physics—a price that few philosophers (or scientists) are willing to pay."[1]

Determinism also rejects the idea that God is in direct conscious control of day-to-day events. Historically, this led to the development of deism, the philosophy that God created the physical laws and initial conditions, and then ceased to play an active role in the universe. According to this philosophy, since God's only role in the universe is to create it in the beginning and then strictly enforce the deterministic laws of physics, no real exchange can take place between God and human beings through prayer or meditation. Thus, if God seems to respond to our prayers, it can only be because the initial conditions of the universe determine the later occurrence of both the prayer and the response. The natural conclusion of this philosophy is that we should

pay attention only to the laws of nature; whether or not God exists in the background is of little practical significance.

In the twentieth century, classical physics has been supplanted by quantum mechanics, with the result that physics ceased to be strictly deterministic. This development led to a number of attempts by prominent physicists to reintroduce the idea of conscious volition into our physical world view.[2-5] However, the advent of quantum mechanics did more than simply add an element of indeterminism. In its standard formulation, quantum mechanics requires us to renounce the idea of forming a coherent theoretical picture of objective reality. This tends to discourage attempts to harmonize physics with any world view that presents God, the material world and the conscious living beings as real entities standing in some kind of mutual relationship. Thus, attempts to relate quantum mechanics to metaphysical ideas have often centered on the drawing of parallels[6] and the use of physical theories to provide metaphors illustrating transcendental philosophies.[7]

In this presentation, I will discuss a reformulation of quantum mechanics and classical mechanics which presents both as non-deterministic theories of an objectively real material energy. Such a formulation can be of interest in the domain of physics since it suggests new ways of carrying out calculations, and it may even suggest new avenues of experimental investigation. But here my main purpose is to explore the relation between modern physical theories and broader metaphysical and theological ideas. My thesis is that both classical and quantum physics are compatible with the idea that a transcendental super-conscious being directs the course of events within a flexible framework of non-deterministic laws. I should stress that this exercise in philosophical speculation can at best suggest tentative possibilities. However, it is only by considering possibilities that we can decide which way to go in the search for truth.

2. CLASSICAL PHYSICS

The first observation to make is that the idea of strict determinism in classical physics was never necessary, even in the eighteenth and nineteenth centuries. To see why this is so, consider Figure 1. Here we see a lattice work of what may be metal rods, arranged in the form of a helix. We can use this arrangement as a metaphor for the idea of determinism in classical physics. The rods are arranged in triangles in such a way that the entire structure is rigid. Thus the shape of the structure as a whole is determined by the lengths of the indi-

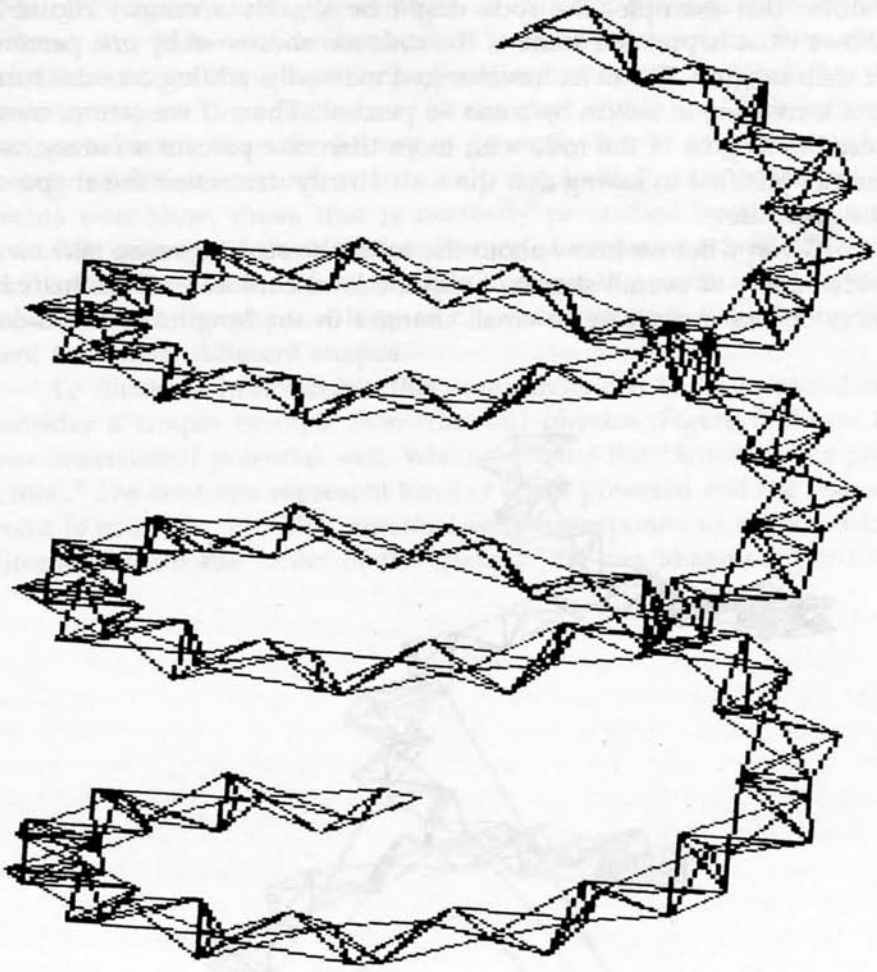


Figure 1

vidual rods, and the position in space of any part of the structure is determined by the orientation of a few of the rods. (These could be the rods at one end of the coil, for example.) The rods play the role of the relations of cause and effect that are expressed in terms of differential equations in classical physics. Given the initial state of affairs in a physical system (i.e., the orientation of some of the rods), these causal relations exactly determine the course of events in the system. This is true if the lengths of the rods are precisely specified.

But suppose that we don't know the lengths precisely, and suppose that in nature the lengths are not rigidly pinned down to exact

values. (For example, the rods might be slightly springy.) Figure 2 shows what happens if some of the rods are shortened by one percent of their lengths. The helix has changed markedly, adding an extra turn and increasing in length by some 66 percent. Thus, if we cannot measure the lengths of the rods with more than one percent accuracy, we are not justified in saying that the rods strictly determine the shape of the structure.

Given what we know about the rods, the structure may take on a wide variety of overall shapes. Only the local curvature of the helix is more or less insensitive to small changes in the lengths of the rods.

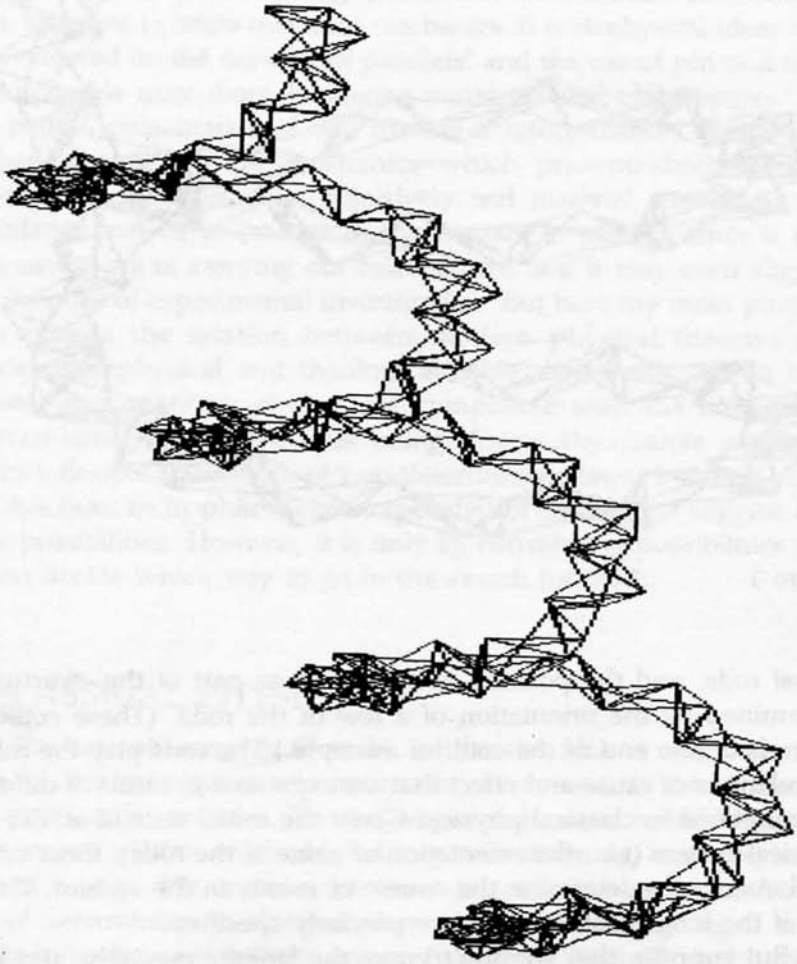


Figure 2

This observation can be generalized to classical physical systems in general. The history of such a system is exactly determined from the initial conditions if the equations of motion are exactly satisfied. But if we only require the equations to be satisfied within the limits of experimental error, then the history is generally free to take on a wide variety of different courses. It is only the local linking together of events over short times that is narrowly prescribed by the natural laws. We can regard the complete history of events as a kind of flexible, spring-like continuum that tends to curve in a certain way in accordance with the physical laws of cause and effect but can be freely bent into many different shapes.

To illustrate how flexible this continuum can be, it is useful to consider a simple example from classical physics. Figure 3 shows a two-dimensional potential well, which is called the Henon-Heiles potential.[9] The contours represent lines of equal potential and the lowest point is in the center. This potential well corresponds to a force field directed toward the center of the triangle. We can imagine a particle

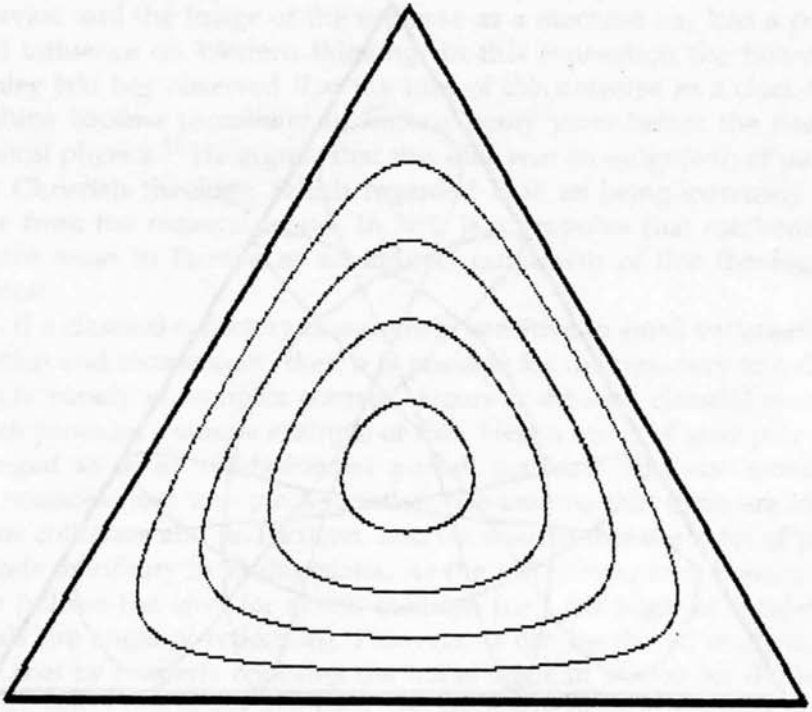


Figure 3

with a mass of, say, one gram moving in this field in accordance with Newton's laws. The classically determined path of the particle cannot be predicted for very far into the future since tiny changes in the direction of the particle will result in large changes in its motion in a very short time.

The diagram in Figure 4 represents a closed orbit for the particle. According to the classical equations of motion, the particle should cycle indefinitely around this closed path if it starts out with the right values of initial position and momentum. However, if the initial position or momentum differ from these values by as little as 10^{-2} (in cgs units), then the particle can quickly deviate from this orbit, and within 140 seconds it can be following a completely different path. In this example, the position and momentum values at each time correspond to the right rods in the example of the helical lattice. We cannot actually measure position and momentum with an accuracy of greater than 10^{-12}, and thus we are required on the basis of empirical evidence to accept that in nature these quantities are more precisely defined than

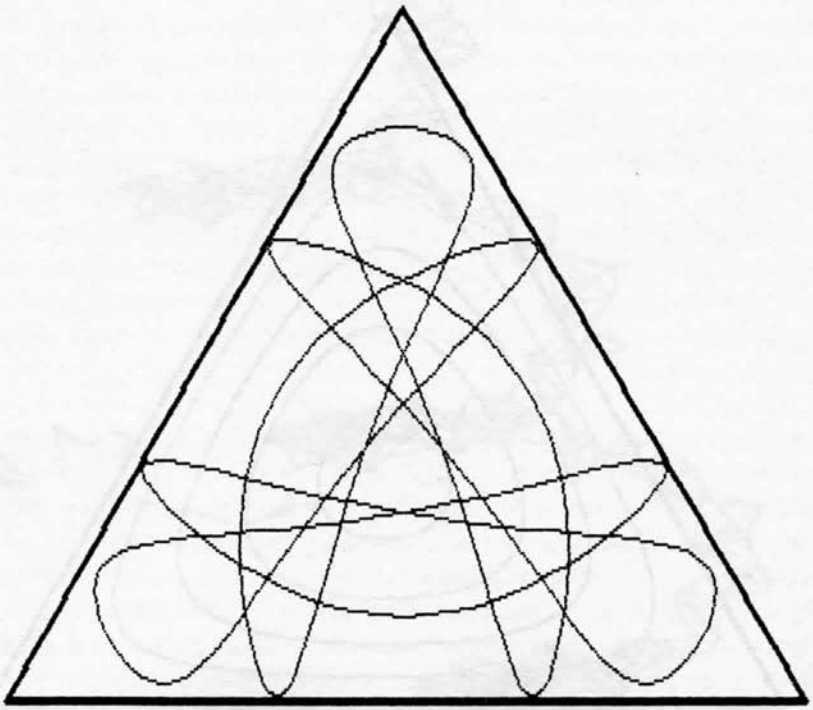


Figure 4

this. It is possible to view the classical equations of motion as approximate relationships which allow for an immeasurably small degree of flexibility in position and momentum. However, if we do this, then it follows that the overall trajectory of the particle is not even approximately determined by the equations of motion. Its curvature over short times is nearly determined by these equations, but its shape over longer times can be freely chosen.

In recent years scientists have noticed that classical equations of motion generally have solutions which are extremely sensitive to the conditions at each given time, and which are therefore unpredictable over fairly short periods of time. They have called this unpredictability "deterministic chaos," and there is now a large literature on the subject. What is surprising is that this was not noticed before (although it was noticed by some physicists, such as James Clark Maxwell[10]). One reason for this is that those classical equations that can be easily solved and analyzed have solutions that do behave in a predictable way, and it was natural for people to think that the same must be true for the equations they couldn't solve.

Another reason for the bias in favor of determinism is that the equations governing machines must necessarily generate predictable behavior, and the image of the universe as a machine has had a powerful influence on Western thinking. In this connection the historian Stanley Jaki has observed that the idea of the universe as a clock-like machine became prominent in Europe many years before the rise of classical physics.[11] He argues that this idea was an outgrowth of medieval Christian theology, which regarded God as being extremely remote from the material world. In fact, Jaki proposes that mechanistic science arose in Europe as an indirect outgrowth of this theological outlook.

If a classical trajectory is extremely sensitive to small variations in position and momentum, then it is possible for the trajectory to follow a wide variety of complex courses. Figure 5 shows a classical system which provides a simple example of this. Here a series of steel pins are arranged as in an old-fashioned pinball machine, and one movable ball bounces from one pin to another. We assume that there are ideal elastic collisions and no frictions, and we assume that the array of pins extends to infinity in all directions. As the ball moves, each bounce exactly follows the laws for elastic collision (i.e., the angle of incidence equals the angle of reflection). However, it can be shown mathematically that by properly choosing the initial angle of motion for the ball, we can select practically any path that we might like for the ball's overall motion. For example, the angle can be specified so that the path

spells out Shakespeare's plays in some particular handwriting. This shows that, in principle, it is possible in a classical system for highly complex patterns to arise that are independent of the classical laws and yet consistent with them.

The examples that I have given thus far are for very simple, ideal-

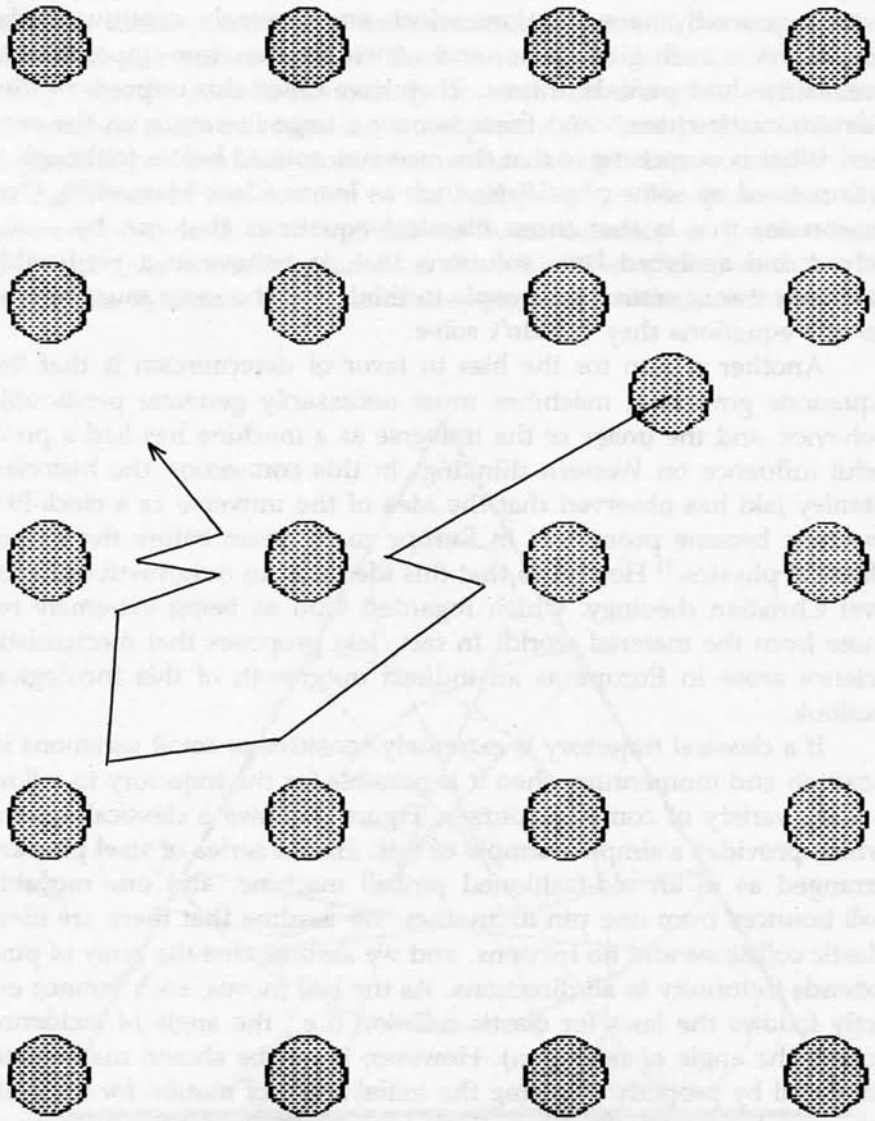


Figure 5

ized systems. However, similar conclusions also apply to complex systems involving many degrees of freedom. I will not discuss the analysis of complex systems in this presentation since this would require much time and would involve many mathematical technicalities. Figure 6 sums up the general picture of classical physics that emerges from this analysis. Here the vertical axis stands for what is called configuration space. Each point in this highly multi-dimensional space represents the complete state of affairs in a complex system at one point in time. If we can be so audacious as to try to apply physics to the world as a whole, then such a point encodes a complete numerical description of other configurations of matter in the entire world (or universe) at one time.

The curved line in Figure 6 represents a particular history of events that unfolds within the complex system. The point where the curve touches the vertical axis represents the initial state of affairs in the system. In the deterministic interpretation of classical physics, the

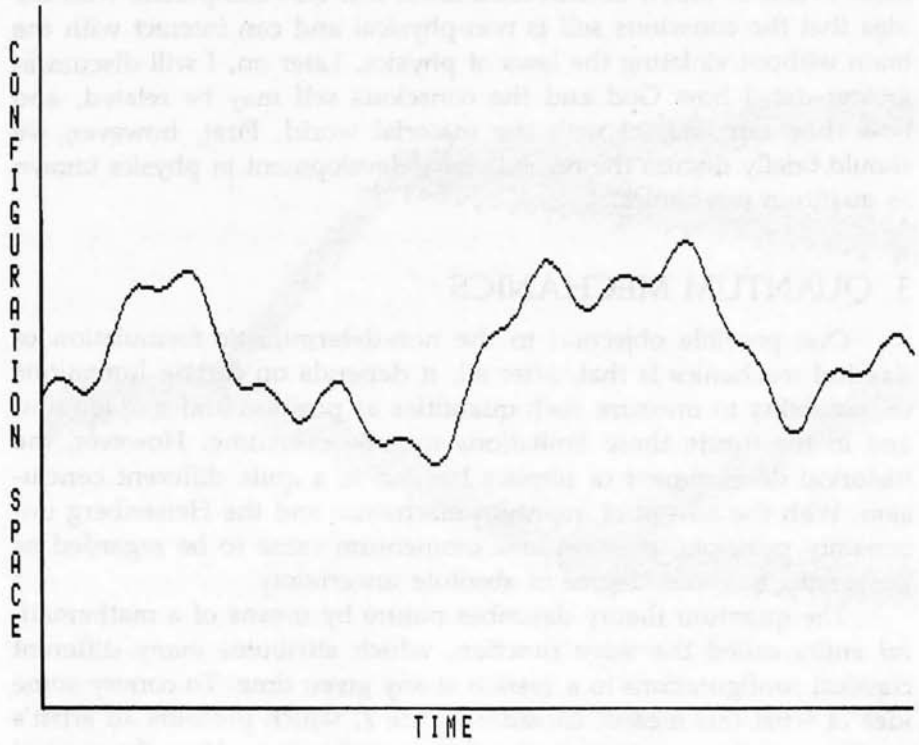


Figure 6

rest of the curve is rigidly determined, given the laws of motion and this initial point. However, it is also possible to formulate classical physics in a nondeterministic way in which the laws of motion determine the local shape of the curve around any particular time, but the overall shape of the curve can be chosen with great freedom.

I should briefly note that in standard treatments of physics, the second law of thermodynamics is introduced by making restrictions on the choice of the initial state of the system. This allows for the irreversible increase of entropy with increasing time. In the nondeterministic approach to classical physics, the second law of thermodynamics can be introduced in the same way. I should also note that this non-deterministic approach can be formulated mathematically by modifying Hamilton's principle, which requires that the action should be stationary with respect to variations in the path. This is discussed in detail in the technical paper mentioned above.[8]

The non-deterministic picture of classical physics is compatible with the idea of God as an omniscient and omnipotent transcendental being who directly controls the course of events, but who also requires these events to follow certain fixed laws. It is also compatible with the idea that the conscious self is non-physical and can interact with the brain without violating the laws of physics. Later on, I will discuss in greater detail how God and the conscious self may be related, and how they can interact with the material world. First, however, we should briefly discuss the revolutionary development in physics known as quantum mechanics.

3. QUANTUM MECHANICS

One possible objection to the non-deterministic formulation of classical mechanics is that, after all, it depends on certain limitations in our ability to measure such quantities as position and momentum, and in the future these limitations may be overcome. However, the historical development of physics has led to a quite different conclusion. With the advent of quantum mechanics and the Heisenberg uncertainty principle, position and momentum came to be regarded as possessing a certain degree of absolute uncertainty.

The quantum theory describes nature by means of a mathematical entity called the wave function, which attributes many different classical configurations to a system at any given time. To convey some idea of what this means, consider Figure 7, which presents an artist's rendition of the quantum mechanical wave-function. Here the vertical axis represents the space of all possible configurations, as before. But

now, instead of a trajectory that passes through one configuration at a time, we have a blurry, wave-like construction that always spreads out over many configurations. On an atomic level this spreading-out is absolutely essential for the theory. For example, the spreading out of the electron orbiting the nucleus of a hydrogen atom plays an important role in the calculation of the atom's energy levels.

However, the wave function can also spread out on a macroscopic level. The standard illustration of this is the Schroedinger cat paradox. Imagine a cat in an apparatus that either kills the animal or lets it live, depending on whether or not a radioactive atom decays within a certain time interval. If we try to use quantum mechanics to describe this arrangement, we find that the wave function divides into (at least) two branches, as shown in Figure 7. One branch represents a dead cat, and the other represents a live cat. Furthermore, if we introduce a human observer into the picture, then we find that the wave function comes to simultaneously represent the observer seeing a live cat and

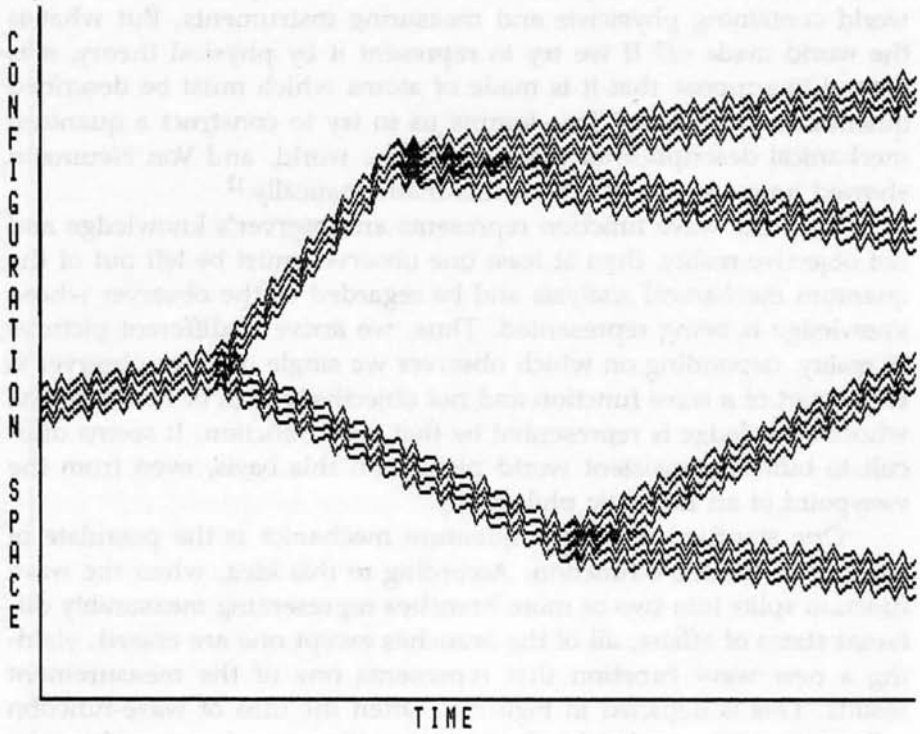


Figure 7

the observer seeing a dead cat.

This creates a problem if we consider that the wave function is supposed to give the most complete description of nature that is possible. I will briefly describe some of the approaches people have taken to cope with this problem. However, this subject is both vast and highly controversial, and I will have to leave out many important points.

The standard response to the problem is to conclude that quantum mechanics does not provide a description of objective reality, and that we should indeed renounce the idea of trying to make such a description. According to this approach, the quantum theory simply provides a system for predicting correlations in our observation, and the wave function represents the state of human knowledge rather than the state of nature. Empirically, it is hard to find fault with this approach, yet it leads to bewildering conclusions if we try to make it the basis of a consistent world view.

If the wave function simply represents knowledge, then whose knowledge does it represent? If we say that it represents the knowledge of a community of physicists, then we must posit a macroscopic world containing physicists and measuring instruments. But what is the world made of? If we try to represent it by physical theory, it is natural to suppose that it is made of atoms which must be described quantum mechanically. This tempts us to try to construct a quantum mechanical description of the macroscopic world, and Von Neumann showed how one can go about this mathematically.[12]

Yet if the wave function represents an observer's knowledge and not objective reality, then at least one observer must be left out of the quantum mechanical analysis and be regarded as the observer whose knowledge is being represented. Thus, we arrive at different pictures of reality, depending on which observer we single out. An observer is either part of a wave function and not objectively real, or he is the one whose knowledge is represented by that wave function. It seems difficult to build a consistent world picture on this basis, even from the viewpoint of an idealistic philosophy.

One standard feature of quantum mechanics is the postulate of collapse of the wave function. According to this idea, when the wave function splits into two or more branches representing measurably different states of affairs, all of the branches except one are erased, yielding a new wave function that represents one of the measurement results. This is depicted in Figure 8. Often the idea of wave-function collapse is accompanied by the idea that the wave function does describe what is actually there in nature. Collapse is postulated to keep

the wave function consistent with our ordinary experience (and thus assure that a cat is either dead or alive). However, quantum theory provides no physical reason for the collapse to occur at any given time, and it has the appearance of an awkward, ad hoc occurrence. Some believe that the consciousness of the observer causes the collapse of the wave function, and that the quantum theory may have to be substantially modified to properly take consciousness into account.[2]

These difficulties have induced some physicists to search for alternative formulations of quantum mechanics. One such formulation is the "many worlds" theory of Everett, Wheeler, and Graham. Here a wave function is assumed for the universe as a whole, and the entire wave function is taken as a direct, one-to-one representation of objective reality. The many macroscopically distinct branches of this wave function are interpreted as distinct, mutually inaccessible universes. As each branch subdivides into further macroscopically distinct branches, the universe bifurcates further into new, divergent copies. This theory

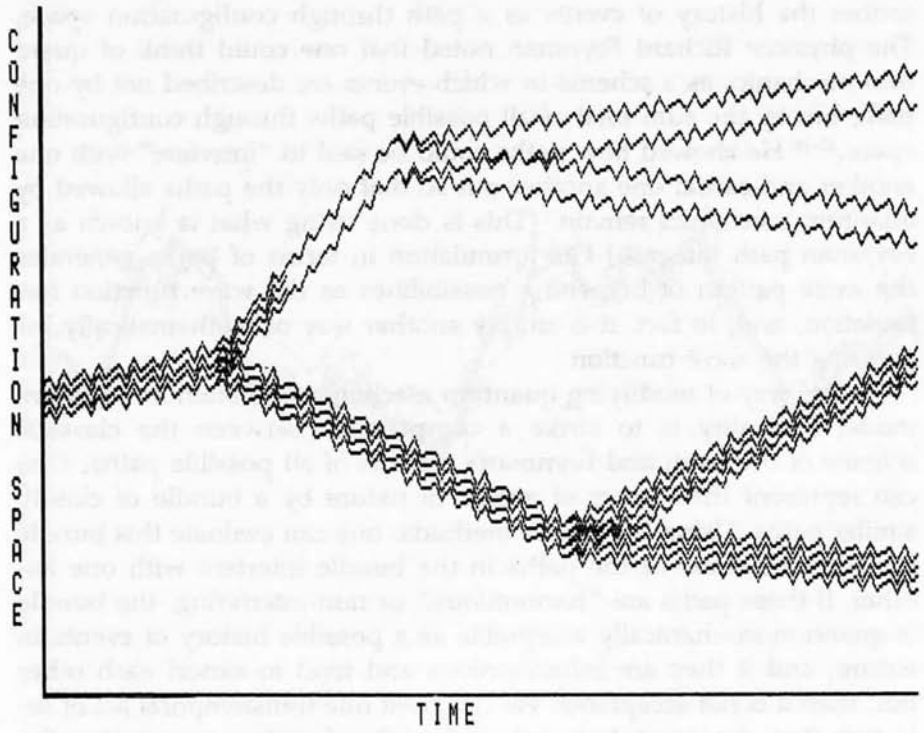


Figure 8

does offer an account of objective reality, and it was once advocated by the physicist John Wheeler as the only workable scheme for a quantum theory of the universe as a whole.[13] However, it suffers from the drawback that it is impossible in principle for us to observe the other universes which would constitute most of this reality.

Another approach is to add "hidden variables" to the quantum theory and thereby transform it into an objective, deterministic (or stochastic) model of nature. A prominent example is the quantum potential theory of David Bohm.[14] Unfortunately, I do not have time to discuss this topic in detail.

4. QUANTUM MECHANICS AND OBJECTIVE REALITY

At this point I would like to indicate briefly how it is possible to formulate quantum mechanics in such a way that it preserves its nondeterministic character and also presents an objective description of nature. The starting point for this is the idea that classical physics describes the history of events as a path through configuration space. The physicist Richard Feynman noted that one could think of quantum mechanics as a scheme in which events are described not by one path, but by the sum total of all possible paths through configuration space.[15-16] He showed how paths could be said to "interfere" with one another and cancel one another out so that only the paths allowed by quantum mechanics remain. (This is done using what is known as a Feynman path integral.) His formulation in terms of paths generates the same pattern of branching possibilities as the wave function formulation, and, in fact, it is simply another way of mathematically expressing the wave function.

One way of modifying quantum mechanics to obtain an objective model of reality is to strike a compromise between the classical scheme of one path and Feynman's scheme of all possible paths. One can represent the history of events in nature by a bundle of closely similar paths. Using Feynman's methods, one can evaluate this bundle to see to what extent the paths in the bundle interfere with one another. If these paths are "harmonious," or non-interfering, the bundle is quantum-mechanically acceptable as a possible history of events in nature, and if they are inharmonious and tend to cancel each other out, then it is not acceptable. We can posit one transtemporal act of selection that chooses a harmonious bundle of paths representing the complete history of events in nature.

Figure 9 depicts such a bundle of paths. The bundle is constructed in such a way that it displays no detectable ambiguity in the values of measurable variables (such as the state of health of cats). However, it also allows for the inherent uncertainty required by quantum mechanics on the atomic level. The technical details of this formulation of quantum mechanics are presented in the paper I referred to in the beginning of the lecture.[8] Formally, it adds nothing new to quantum mechanics, but it shows how this theory can be seen to provide a non-deterministic account of objective reality.

It also shows how quantum mechanics and classical mechanics can be given a similar form. The selection of the bundle of paths in this version of quantum mechanics is comparable to the selection of the single flexible path in the non-deterministic formulation of classical mechanics. The local shape of the bundle is sharply constrained by the physical laws, but the bundle's overall shape can be freely chosen. The difference between quantum mechanics and classical mechanics

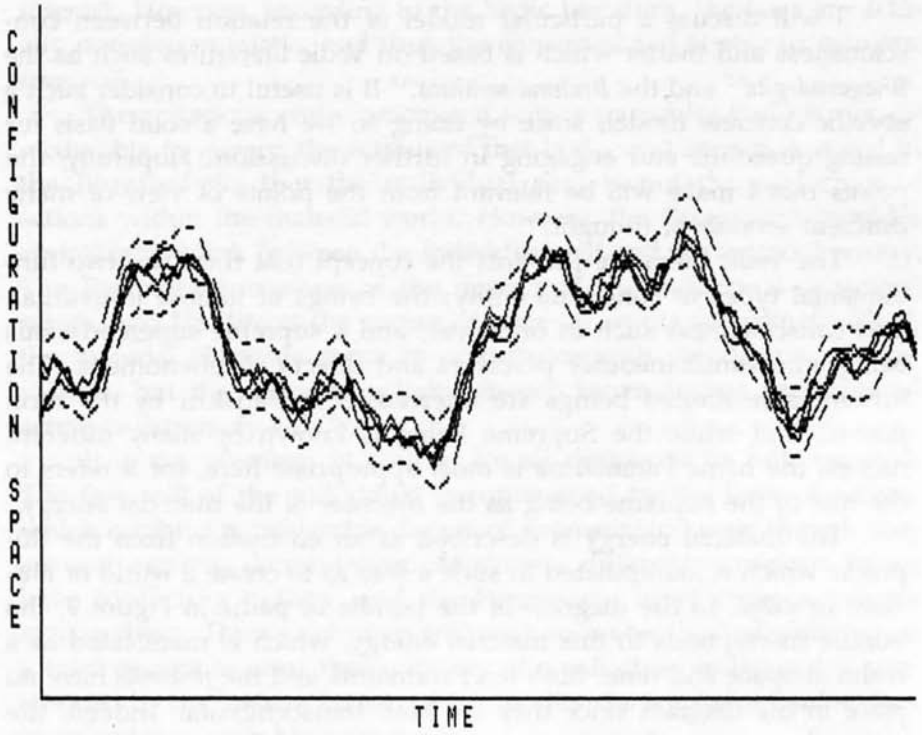


Figure 9

lies in the fact that the quantum mechanical bundle of paths is free to flex in more ways than the classical path. Thus we can say that quantum mechanics is more undeterministic than classical mechanics.

5. TRANSCENDENTAL DIMENSIONS

At this point let us return to the topic of the relationship between God, the conscious self, and the material world. I do not want to tie this discussion too closely to the particular formulations of physical theory presented here because physical theories are always subject to change, and it is unlikely that we will ever be able to give a complete theory of matter in all of its diverse aspects. Rather, I would like to simply abstract from these formulations the idea of the history of material events in space and time as a kind of flexible continuum that can both satisfy non-deterministic laws of physics and be molded with great freedom in accordance with other considerations. Such a formulation of natural laws has been consistent with the developments in physics from Newton's time down to the present.

I will discuss a particular model of the relation between consciousness and matter which is based on Vedic literatures such as the *Bhagavad-gītā*[17] and the *Brahma-saṁhitā*.[18] It is useful to consider such a specific concrete model, since by doing so we have a solid basis for raising questions and engaging in further discussion. Hopefully, the points that I make will be relevant from the points of view of many different schools of thought.

The Vedic literature presents the concept that there are two fundamental types of conscious entity: the beings of limited individualized consciousness such as ourselves, and a supreme superconscious being who simultaneously perceives and directs all phenomena. The innumerable limited beings are referred to in Sanskrit by the term *jīvātmā*, and while the Supreme Being is known by many different names, the name Paramātmā is most appropriate here, for it refers to the role of the supreme being as the overseer of the material energy.

The material energy is described as an emanation from the Supreme which is manipulated in such a way as to create a world of illusion, or *māyā*. In the diagram of the bundle of paths in Figure 9, the bundle corresponds to this material energy, which is manifested as a realm of space and time. Both the Paramātmā and the *jīvātmās* have no place in the diagram since they are both transcendental. Indeed, the material energy is also of a transcendental or spiritual nature, since it is an emanation of the Supreme and in this sense does not exist as an

independent substance. However, we can portray matter as having an independent existence, because its behavior is adjusted by the Paramātmā to create this impression.

The Paramātmā creates the illusion that the material energy acts independently by imposing certain regular laws on its behavior. These laws allow for many mechanical processes to take place in nature without any apparent need for higher intelligent guidance. According to the Vedic literatures, these laws include not only the familiar laws of physics, but also psychological laws governing the functioning of material minds.

The entire system is intended to provide a field of activity for limited conscious selves, or *jivātmās*, who are connected with machine-like bodies and minds fashioned from the material energy. The connection between the transcendental conscious self and the material body is maintained by the Paramātmā, and this is done due to the inner desire of the self to experience material enjoyment. If the laws imposed on the material energy were strictly deterministic, then we would have a model in which the *jivātmās* are essentially epiphenomena, going helplessly along for the ride as the material elements interact. However, according to the Vedic literature, the laws are actually non-deterministic, and thus the conscious self is able to manifest free will.

The conscious entity associated with a particular body is not directly able to govern the actions of that body, and thus it is stated in the *Bhagavad-gītā* that the individual soul is not the performer of actions within the material world. However, the Paramātmā provides an interactive link between the individual self and the material energy. The Paramātmā is aware of the desires of the individual conscious selves, and He directs the course of material events accordingly. Thus, the material elements move in accordance with the desires of individuals, but the connecting link between inner desires and material action is extremely subtle.

It is not possible, of course, for all desires to be fully granted. The free will of the individual is constrained by the laws of nature, which exhibit a considerable degree of determinism, even though they are not entirely deterministic. Moreover, different conscious selves have conflicting desires, and the Paramātmā must strike a balance among them. Thus a rich man will wish to protect his valuables while a thief desires to steal them. Finally, the will of an individual is constrained by the laws of *karma*, which modify the course of his fortunes in accordance with his past deeds.

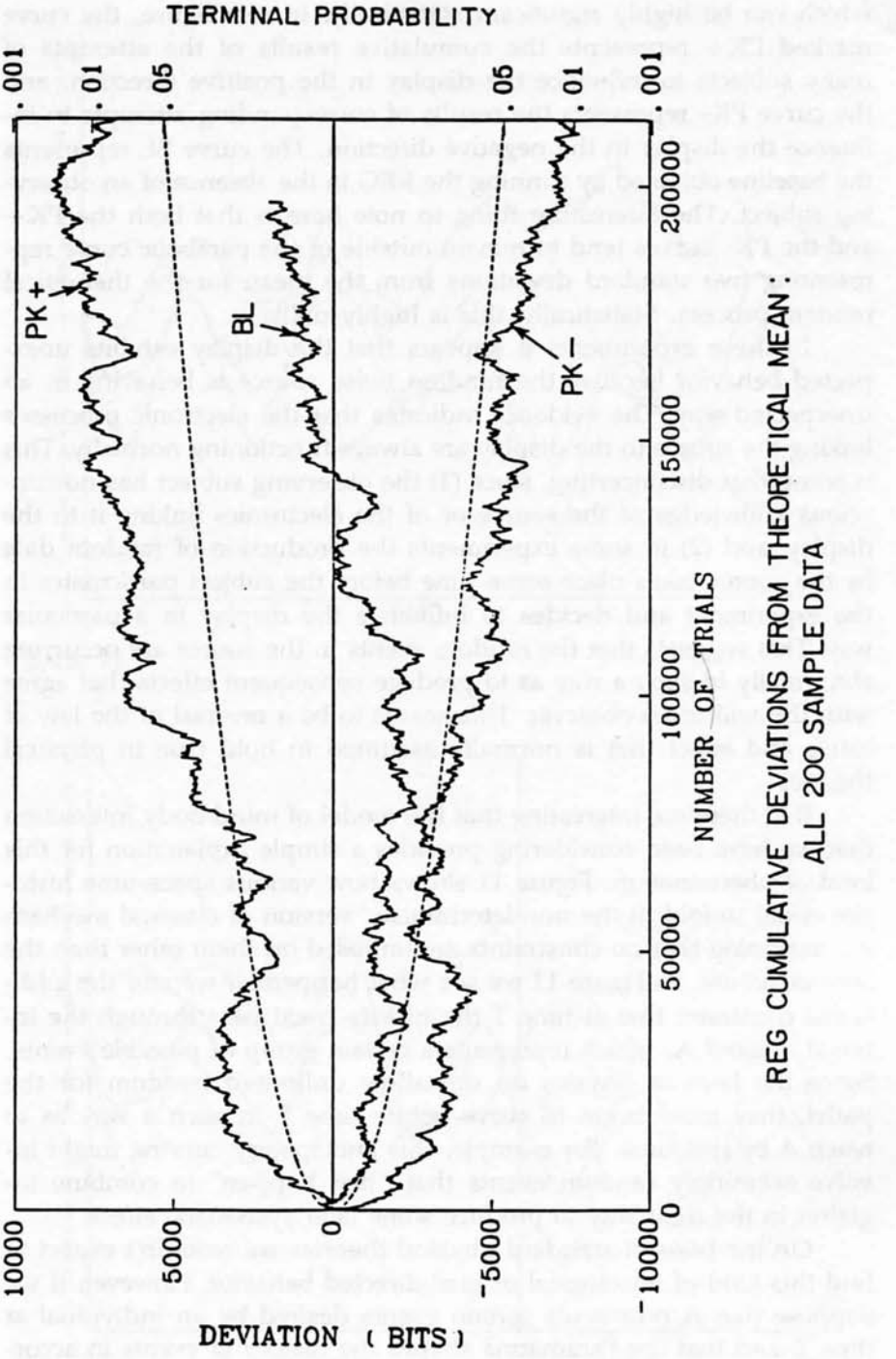
In the *Bhagavad-gītā* it is described that the superconsciousness,

or Paramātmā, completely transcends material time and space. However, this does not mean that He exists in a timeless void. Rather, events at all moments and locations in space-time are directly perceived and directed by Him. In addition, there exist other space-time continua and completely non-material realms of experience which all lie within the Supreme's field of consciousness. The shaping of the material space-time history by the supreme will can thus be seen either as a process unfolding in time or as a transtemporal act of willful selection. I should note that this idea is an example of Sri Chaitanya Mahāprabhu's principle of *achintya-bhedābheda-tattva*, which describes the Supreme Being as simultaneously possessing variegated features and perfect unity.

If the Paramātmā knows the entire space-time situation, then it may seem that the *jivātmās* cannot have free will. However, by free will we simply mean the actual volition of the transcendental self, as opposed, for example, to the pattern of actions and reactions generated by neurons in the brain. The conscious self exerts his free will when material events, starting with events in the brain, occur in accordance with his desire, even though these events are actually directed by a higher agency.

This model of interaction between the conscious self and the material energy has some simple consequences which may shed light on some of the apparently inexplicable phenomena observed by parapsychologists. Figure 10 shows some data reported by Dean Robert Jahn of the School of Engineering of Princeton University.[19-20] Jahn and his colleagues have been investigating the apparent ability of many people to mentally influence processes which, according to physical theory, should be happening independently of human volition. They have conducted an extensive series of experiments using what they call random event generators, or REG's. These are devices in which a physical process, such as electronic noise, is used to generate a stream of pluses and minuses which theoretically occur at random with a probability of 50-50. The running total of the pluses and minuses is registered on a visual display that is observed by a human subject. The subject (who is generally an ordinary person and not a psychic) tries to will the display to change constantly either in the positive direction or the negative direction.

Theoretically the total of the pluses and minuses should execute a random walk that is centered about a mean of 0, and that wanders on either side of 0 in the manner predicted by statistical theory. However, Jahn and his colleagues have seen that when many people will the display to drift in a particular direction, it will show a tendency to do so


TERMINAL PROBABILITY
.001
.01
.05
.05
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PK+
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100000
150000
200000
DEVIATION (BITS)
NUMBER OF TRIALS
REG CUMULATIVE DEVIATIONS FROM THEORETICAL MEAN:
ALL 200 SAMPLE DATA

Figure 10

which can be highly significant statistically. In this figure, the curve marked PK+ represents the cumulative results of the attempts of many subjects to influence the display in the positive direction, and the curve PK- represents the results of corresponding attempts to influence the display in the negative direction. The curve BL represents the baseline obtained by running the REG in the absence of an observing subject. The interesting thing to note here is that both the PK+ and the PK- curves tend to remain outside of the parabolic curve representing two standard deviations from the mean for the theoretical random process. Statistically, this is highly unlikely.

In these experiments it appears that the display exhibits unexpected behavior because the random noise source is behaving in an unexpected way. The evidence indicates that the electronic processes linking the source to the display are always functioning normally. This is somewhat disconcerting, since (1) the observing subject has no conscious knowledge of the source or of the electronics linking it to the display, and (2) in some experiments the production of random data by the source takes place some time before the subject participates in the experiment and decides to influence the display in a particular way. This suggests that the random events in the source are occurring abnormally in such a way as to produce subsequent effects that agree with the will of an observer. This seems to be a reversal of the law of cause and effect that is normally assumed to hold true in physical theories.

It is therefore interesting that the model of mind/body interaction that we have been considering provides a simple explanation for this kind of phenomenon. Figure 11 shows how various space-time histories could unfold in the nondeterministic version of classical mechanics, assuming that no constraints are imposed on them other than the laws of nature. In Figure 12 we see what happens if we add the additional constraint that at time T the history must pass through the interval marked A, which represents a certain group of possible events. Since the laws of physics do not allow unlimited freedom for the paths, they must begin to curve before time T in such a way as to reach A by that time. For example, this anticipatory curving might involve seemingly random events that "just happen" to combine together in the right way to produce some later systematic effect.

On the basis of standard physical theories we wouldn't expect to find this kind of teleological or goal-directed behavior. However, if we suppose that A represents certain events desired by an individual at time T, and that the Paramātmā shapes the history of events in accordance with this desire and the laws of physics, then it follows that such

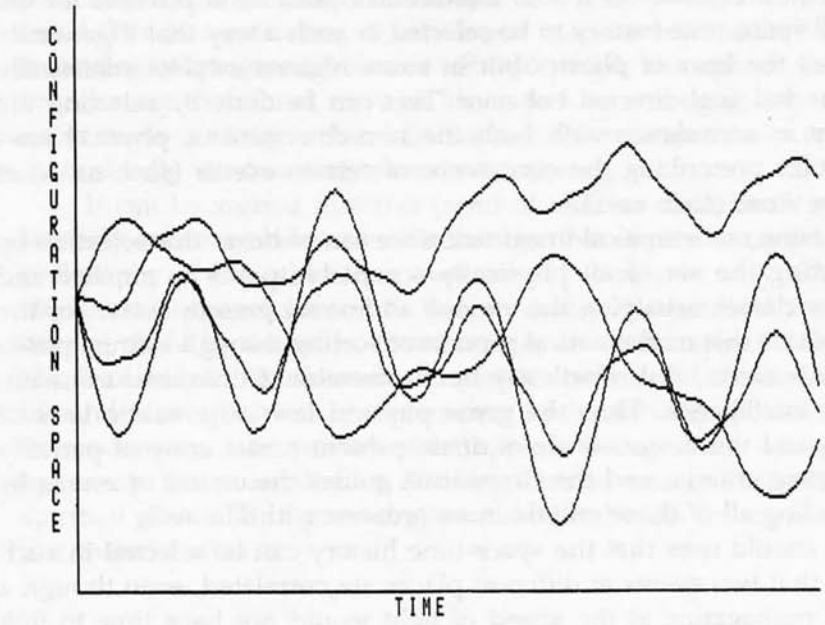

Figure 11

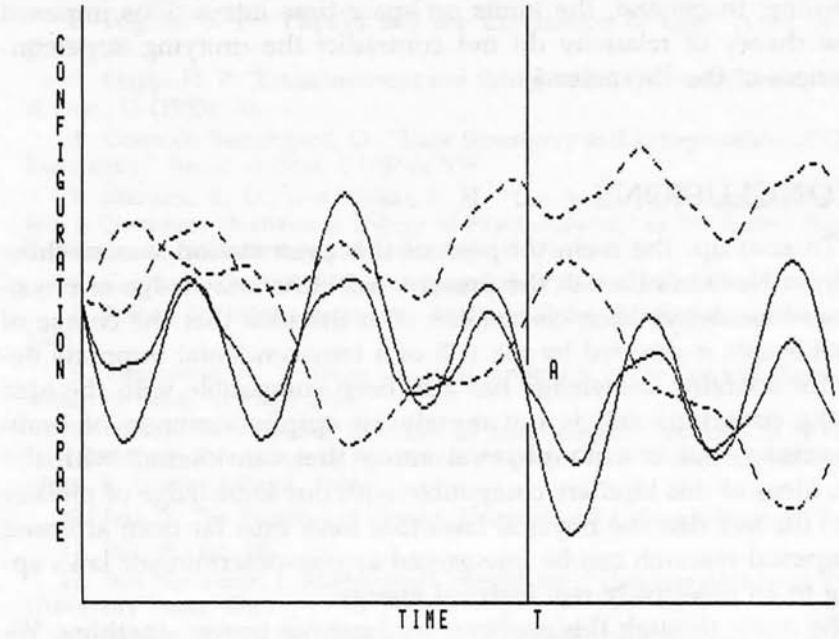

Figure 12

teleological behavior of matter should take place. It is possible for the overall space-time history to be selected in such a way that it generally satisfies the laws of physics but in some regions exhibits statistically unexpected goal-directed behavior. This can be done by selecting the history in accordance with both the non-deterministic physical laws and rules prescribing the occurrence of certain events (such as A) at certain times (such as T).

Using mathematical imagination we can perform this selection by restricting the set of all physically acceptable paths to smaller and smaller classes satisfying the various additional prescriptions. For the Paramātmā this mathematical process of sorting through infinite possibilities is carried out effortlessly by the exercise of unlimited transcendental intelligence. Thus the gross physical laws, the subtle laws of *karma*, and the desires of the *jivātmās* present a vast array of partially conflicting criteria, and the Paramātmā guides the course of events by reconciling all of these criteria in accordance with His will.

I should note that the space-time history can be selected in such a way that two events at different places are correlated, even though a signal propagating at the speed of light would not have time to link one event with the other. This might seem to violate the theory of relativity, but actually it does not since this theory restricts the development of correlations which propagate by cause and effect within space-time. In general, the limits on space-time interactions imposed by the theory of relativity do not contradict the unifying superconsciousness of the Paramātmā.

6. CONCLUSIONS

To sum up, the main purpose of this presentation was to show that from Newton's time to the present, scientific knowledge of physical laws has always been compatible with the idea that the course of natural events is directed by the will of a transcendental Supreme Being. Our scientific knowledge has also been compatible with the idea that the conscious self is not merely an epiphenomenon of brain mechanisms, but is a nonphysical entity that can interact with the brain. Ideas of this kind are compatible with our knowledge of physics due to the fact that the physical laws that have thus far been affirmed by empirical research can be interpreted as non-deterministic laws applying to an objectively real material energy.

By going through this analysis, we have not proven anything. We have only demonstrated a possibility. But in view of the history of the

past three hundred years, this might be a good possibility to keep in mind. The understanding of nature as a machine has resulted in much technological progress, but now we find people throughout the world abandoning traditional ways of life to join in a struggle for technical supremacy—a struggle that culminates in the construction of more and more deadly machines of mass destruction.

It can be argued that this trend of modern civilization has been strongly encouraged by scientific theories that appear to contradict any philosophy of life other than materialism. It may be very difficult to change this dangerous trend. But an essential ingredient for such a change could be the wide dissemination of a valid approach to scientific knowledge that allows for a tangible spiritual dimension to human life and is compatible with the ancient understanding that mankind is dependent on a transcendental Supreme Being. Such an approach opens up the possibility of directing human energy towards higher spiritual goals and of providing a solid ethical basis for the conduct of our material affairs.

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QUESTIONS AND ANSWERS

Q: Is the supreme conscious being leading us in the right direction by intercepting human consciousness? If yes, then what is the significance of the present dangers and uncertainities that we have created for mankind? If no, why?

RT: I suspect that this raises the question of the nature of evil. If God is actually the controller of events in the world, how is it that bad things happen? This, of course, takes us away from physics into a specifically theological question. My understanding is that we are endowed with free will. Free will means that one has the option to get into trouble if he wants to. If one was consistently constrained from doing so, then he would not have free will.

The idea here is that the Supreme directs the interactions of matter by which we are able to exhibit our freedom of choice. Now this brings us to issues which keep coming up, such as the evils of nuclear armaments and many other terrible things that are happening today. Traditionally in the sphere of religion there are laws of moral or ethical guidance coming from God and intended for the direction of human activity. But these are not hard and fast laws like the laws of physics. They are laws which one can follow for his own good. Now, if we really think that God could not be imposing such laws on this world, then the laws would be man-made and lack force. But if we can come to an understanding of the relation between God and the world which at least allows for the possibility of divine guidance, then we can consider the idea that there may be absolute moral standards. Sometimes

there is an attempt on the basis, say, of the theory of evolution to deduce absolute moral standards from evolutionary or material considerations. An example is the theory of altruism. But these attempts fail and lead simply to cynicism.

Q: Are conscious selves and material energies radically different entities? If yes, then how can there be interaction between such entities? How can God, who is spiritual, act upon or even create matter, which is inert and lifeless?

RT: Again the answer here comes from the Vedic *shastra*, or theological sciences. As far as physics goes, we do not really know what matter is. Our scientific theories are, as I was saying before, just mathematical models in which we correlate our observations and we try to draw a consistent picture. Ultimately we cannot say what matter is. But according to the version of Vedic *shastra*, material energy is an emanation from the supreme conscious being and is also spiritual by nature. So it is natural for the Supreme Being to be able to manipulate this material energy. It only appears to be inert and lifeless. In fact, in the scheme I outlined of the world of physical laws, one could ask, "Why even consider physical laws, anyway?" But in the Vedic philosophy, physical laws set up a world in which things seem to act independent to God. This is the idea of *māyā*, or illusion. So the world seems to be disconnected from God, but actually it is not disconnected.