

CONSCIOUSNESS TRANSCENDS ALL DISCIPLINES

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SUMMARY

This paper is about ‘Consciousness’ and its multidisciplinary nature. Indeed, Consciousness transcends all spheres of thought. As such, it can be discussed from very many angles. Because of the depth of the subject, it is necessary first to prepare the ground for discussion. This includes a number of topics which are important for almost any in-depth discussion of the subject. A basic theory of the nature of Consciousness and Reality is presented; this theory appears to be the only one available at this time which is at the scientific level. This theory is based on an axiom whose validity is discussed and which is shown to be more appealing than the other currently available theories. Next, it is shown that consciousness is beyond the limitations of time and space. This leads us into the nature of reality, and provides a synthesis of science and religion through spirituality. In particular, we show that the famous ‘mind-body problem’ is resolved. We also show that the Vienna circle type of philosophers have mistaken beliefs, and that indeed Science is a lower part of Spirituality. We shall discuss the fact that Science can not fathom the mysteries of the universe; we shall see that Spirituality does.

1. INTRODUCTION

1.1 We begin by noticing that consciousness is a highly multi disciplinary subject. Of course, it has long been recognized as an important aspect of religion and spirituality. But, for almost 80 years now, it has come to be recognized as having to do something with science as well, particularly at deeper levels such as quantum mechanics. In this paper, we shall make an attempt to look at it from a few of these angles.

1.2 We take the physiological angle. An anesthesiologist is interested in it from the point of view of making a person temporarily unconscious so that surgery may be done without pain. Here, there is a human being with a body, and by injecting certain chemicals in this body, it is found that the person temporarily becomes unconscious. So, in this case, it is found that consciousness has something to do with the presence of a chemical in the body.

1.3 Next, we consider an example from Chemistry. Consider mixing zinc granules with dilute sulphuric acid. We know that this will generate hydrogen and zinc sulphate. Clearly, in a certain sense, the molecules of zinc and sulphuric acid ‘recognize’ each other. They also ‘know’ how to combine in a new manner. This may be called ‘Cognizance’. So, we can say that the molecules of zinc and sulphuric acid are

'cognizant' of each other. Notice that they are able to interact with each other: firstly, because they are molecules, and secondly, because they are in a chemical situation which allows them to interact. (A situation which would not allow them to interact would be, for example, if they are in two different test tubes.)

1.4 Now, consider the *statement*: "I am a zinc molecule and I am faced with a molecule of sulphuric acid, and because of that I interact with it." Note that this *statement* is not a molecule, and there is no evidence that either the zinc molecules or those of sulphuric acid are cognizant of *statements*. (In other words, we have never seen a molecule of any of these interacting with a statement.) Thus, we find that the molecules of the two substances are cognizant of each other, but they are not cognizant of the fact that they are cognizant of each other.

1.5 Recall now the famous statement of Descartes: "I think, therefore, I am." Here, this great scientist is making two important assertions: (i) "I am conscious of the fact that I am conscious", and (ii) "Because I am conscious, I am a living (or, 'animate') person". To appreciate (i), consider the process of my reading a book. My eyes are cognizant of the book. But, I am cognizant also of the fact that my eye is cognizant of the book. Thus, I am cognizant of the assertion: 'I am cognizant of the book'. In other words, unlike the molecules of zinc and sulphuric acid, my cognizance has the attribute of 'Self-reference'. This kind of cognizance which has the feature of self-reference will be called "Consciousness". Notice that, in (i), Descartes is also emphasizing this feature, namely, that 'Consciousness' is a "Self-referring" concept in the sense that a conscious person is conscious of his or her consciousness.

1.6 This self-referring feature is a very important ingredient in the proof of the theorem of Goedel in Logic and Mathematics. This theorem, which is a very important result in all of knowledge, is also very insight-giving in the general field of Nature of Reality. It shows that Science has a basic limitation in that it can *not* fathom the depths of the Universe. Using the idea of self-reference, the author's theory provides deep insight into the nature of Consciousness; we shall touch upon this in sec. 3 and 5. Here, it is important to realize that 'Cognizance' is an important field within Psychology. Thus, in the paragraphs above, we have brought together concepts from Chemistry and Psychology and combined them with concepts from Logic and Mathematics, all with a relevance to Consciousness.

1.7 Following assertion (ii) of Descartes, in this paper, we shall call an entity as 'living' or 'animate' if and only if the entity has 'Consciousness'. Entities which do not possess consciousness shall be called 'inanimate'. Thus, the word 'Life' shall not refer to the ability to reproduce, rather it shall refer to being animate (i.e., having 'Consciousness'). A series of papers [Srivastava (2002a, 2003, 2004-5)] have been written by the author along these lines; more are in the making.

1.8 The subject of Consciousness also arises in the context of Quantum Reality, which deals particularly with fundamental particles in Physics. There are essentially eight major theories in Quantum Reality; these are discussed in detail in Herbert (1985). These theories are respectively due, among others, to: #1.Bohr, #2.Wheeler, #3.Bohm, #4.Everett, #5.Finkelstein, #6.Einstein, #7.von Neumann, and #8.Heisenberg. Of these, theories #2 and # 7 (which are variations of #1) involve Consciousness. In section 4, we shall discuss these eight theories in conjunction with the author's theory TK showing, in particular, that the latter has a more appealing paradigm.

1.9 Besides the above, there are two other large disciplines that we shall dwell on: Philosophy and Spirituality. We shall show that the author's theory TK resolves the famous 'mind-body problem', and that Science is really a small (though very significant) part of Spirituality.

1.10 In the next section, we shall discuss many fundamental concepts on which further discussion shall be based. This will be followed by sections on the basics of the author's theory TK and the validation of a basic axiom of TK in the realm of Quantum Reality. Next, it will be seen that Consciousness is independent of Time and Space, and insights will be provided on its basic nature. The paper shall end with a discussion of the nature of Reality and how spiritual statements could be provided scientific support.

1.11 The discussion on each of these topics will be in a greatly condensed form because of lack of space.

2. CONSCIOUSNESS AND REALITY: SOME BASIC ASPECTS

2.1 COMPLETE OBJECTIVITY IN EXPERIMENTATION IS NOT POSSIBLE

Many people who criticize metaphysics maintain that it is subjective, while good scientific work should be objective. However, Reality is so incomprehensibly vast that in all experimentation, objectivity can only be conditional. In other words, all experiments have a subjective element in them. This is called the 'Law of Intrinsic Confounding in Scientific Experimentation'.

To elaborate, suppose a person who lives in the middle of a desert decides to do an experiment to determine what kind of birds are there in the world. Suppose this person is in a small town and the desert extends around him for thousands of miles, and that he has never been outside this area and does not know anything about the outside world. Now suppose that this person objectively chooses a place where he will try to observe birds. It is obvious that this person will never see a penguin. Notice that even though this person has practiced objectivity to the maximum, he is still constrained by the fact that the choice of the place where the experiment is done is limited by his circumstances.

In scientific work, two things (say, p and q) are said to be confounded if p and q can not be separated. For example, suppose someone says that he was given p dollars by one friend and q dollars by another friend and the total of p and q is 20, but he does not give the value of p and q separately. Then, obviously, p and q cannot be separated and they will be said to be 'confounded'.

Similarly, the above Law states that the results of any scientific experiment are confounded with the effect of the place and the time where the experiment is done. Notice that whatever place or time we choose is subjective. Thus, there is an intrinsic subjective element in all scientific experiments.

When the field of investigation is relatively small, the effect of this law may be ignored. However, Metaphysics deals with The Whole, which is infinite relative to Man and his observation capacity. Thus, investigations on the nature of Reality will, therefore, have to reckon with the above Law at every step. In other words, we can not pull down disciplines (such as Spirituality) merely on the grounds of subjectivity.

2.2 CONTEXT-ISM

In the field of philosophy, certain phrases (propounded by Popper, Wittgenstein, and others) are common. Thus, 'Contextual-ism' says that our inferences are often based on the ground (or context) of a set of beliefs (or axioms) that are not themselves supported. On the other hand, 'Foundational-ism' says that there is a set of facts which form the core foundation for our thinking and which are intrinsically evident. Thus, here, we have a belief system which we call 'evident', and then we proceed to develop an intellectual structure based on such a system. Also, we have 'Coherent-ism'; this maintains that our inferences should be coherent with the axioms or the basic beliefs of our intellectual structure.

The concept of Context-ism combines the above three concepts and adds a further feature to the same. Thus, in order to build an intellectual structure (in other words, in order to study Reality), we need to ask questions. In order to be able to answer questions meaningfully, it is necessary that the questions themselves be intelligible and clearly stated. This, in turn, means that the context inside which the questions are embedded must be explained as clearly as possible. But, here, we run into a difficulty.

In order to explain the question, we need to precisely define the words which are being used to state the question. But, the explanation of these words requires the use of other words, whose explanation requires further words, and so on. Thus, there is no limit to which we can go in the attempt to define the questions 'clearly'. Because we can not continue this process infinitely, eventually we have to stop it, i.e., we have to stop defining. Notice that it is at this point that we can be said to be under Contextual-ism in the sense that the further definition of the words that are undefined is not known and therefore not supported.

On the other hand, some people may say that at the current level the basic words that have been used are intrinsically evident. In this case, according to such people, we shall reach Foundational-ism. Also, of course, we need Coherent-ism in our intellectual structure; we do not want to have contradictory notions sitting with each other simultaneously. Here, it should be emphasized that the more we sharpen the definition of the context, the more precisely the questions can be answered. However, the more we sharpen the context the smaller the sector of Reality shall be to which our answer will apply.

The reader should not form the impression that the above problem of context-ism arises only in pathological or rare cases. Indeed, it can arise at any point, even in simple situations. For example, let us ask the question: what is $1+1$? Of course, the answer depends upon the definition of 1 and +. Normally, we have $1+1=2$; this is the context where we are working in the so-called 'field of real numbers'. However, in communication theory, where we send information in the form of a sequence of zeros and ones, another world arises: in this digital world (called 'the finite field $GF(2)$ '), we work only with two numbers 0 and 1, which obey the rule: $0+0=0$, $0+1=1+0=1$, and $1+1=0$. Now, because of noise in the media (for example, in communication with satellites), what is sent is sometimes not the same as what is received, i.e., 0 is received as 1 and 1 as 0; in these cases we say that an error has occurred. The subfield of communication theory known as 'coding theory' is devoted to the question of how to know precisely what was sent even though some errors may have occurred; $GF(2)$ is extensively used here.

To elaborate, consider the formula: “the number received= the number sent + ‘error’ ”, where the ‘error’ equals ‘0’ or ‘1’. Then, it can be checked that, under the rules of GF(2), this formula always gives the correct answers. For example, if a ‘1’ is sent and an error occurs, then according to this formula we shall receive 1+1, which equals 0 as it should be. Coding theory is an advanced subject and we shall not go into it here any further. However, the above example is given to illustrate the fact that the ‘clarification’ of the context can influence the answer drastically, and also that no context is universally valid.

As explained earlier, we can not keep clarifying the context indefinitely; at some point we must stop. At this point, we would be either in the Contextual or the Foundational ground, depending upon the attitude taken. Thus, under the former case, we can, following the philosopher Hume, dismiss Science, since ‘it is based on axioms which are themselves not supported’. But, such an attitude would be extreme; we can work conditional to the axioms. In any case, for communication to occur, we have to accept the Foundational ground. In other words, for entities A and B to communicate, they must (irrespective of how antagonistic they are to each other) agree to recognize the basic ground as acceptable to both. But, an agreement is a form of cooperation, and cooperation is a form of Love. This reminds us of the saying in spiritual circles that Love is the driving force in the world!

To summarize this subsection, it is clear that if there is a proposition (say, P), then the answer to the question “Is P true or false?” depends upon the context. Furthermore, this answer is acceptable only to the extent that the context is acceptable. As stated earlier, in order to ask P, we shall have to eventually stop defining the context. However, one may further refine the definition of the context (including the words used in stating P) so that now P may not have much resemblance to the original question. This leads us to the next subsection.

2.3 REALITY CAN BE SEEN ONLY THROUGH A PERSPECTIVE

By ‘seeing’ Reality, what we mean is that we have the ability to ask questions about Reality and obtain correct answers. But, from the last section, we see that if we frame a proposition P, then we first need to satisfactorily define the context, accept the definition (and the lack thereof), and then proceed. This accepted context, howsoever blurry or clear, can then be regarded as our perspective. Through this perspective, we shall see the portion of Reality that refers to P.

As an analogy, consider the Pacific Ocean. It is not possible for us to see all of it in full detail simultaneously. From space, we can see its boundary, but not the waves; from a boat we can see the nearby waves, and nothing else; from a submarine, we can see only the water and the sea life around it; and so on. But, each of these views is only a perspective. Of course, there are billions of perspectives. A similar situation exists with respect to Reality, except that it is incomprehensibly, infinitely, infinitely, large. We can ask questions in the physical, chemical, psychological, biological, mathematical or other sectors, using some perspective, and get some answer. But, invariably, all the time, every look at Reality is only through a perspective, and therefore Foundational or Contextual or both depending upon the adopted attitude.

2.4 GOEDEL'S THEOREM: SCIENCE CAN NOT FATHOM REALITY

The famous theorem of Goedel is a result in logic, which is considered to be one of the most important facts in all of knowledge. It has a very important implication, showing that Reality is so vast that science can not fathom it too deeply. We discuss this briefly. Consider any system, i.e. any rational structure of ideas, which involves the natural numbers (0, 1, 2, 3, . . .). It does not matter how the natural numbers are involved. Such a system may be called a mathematical system. We shall assume that there are objects inside the system, and that these objects obey a set of rules, called 'axioms'. The axioms are said to be consistent if no axiom contradicts any of the others either singly or taken together. Also, the axioms are said to be independent if no axiom can be derived from the rest by using the rules of logic.

To give an example, consider the system S obeying the following rules: (1) S consists of a box containing 200 sticks, each stick being of the same width and thickness; (2) for each stick contained in the box, there is at least one stick in the box that it is of the same length or is 1 mm longer; (3) there are at least two sticks of the same length; (4), for each stick in the box, there is at least one stick of a smaller length. Notice that the rules #1 and 2 are both independent and consistent. Also, rule # 4 is not consistent with the first two rules, because it contradicts the first one in this sense that, if it was true then the box would contain an infinite number of sticks. On the other hand, rule #3 is not independent of rules #1 and #2, because otherwise the box would have an infinite number of sticks.

Now, consider a system S as above. The system S must have a set of independent and consistent rules. To focus attention, suppose that the system has 82 rules. (Here, the number 82 is taken just for an example; we could have taken any other number in place of 82.) The theorem of Goedel says that there exists a question concerning S which cannot be answered 'yes' or 'no' using the 82 rules of the system. In order to answer this question, we could introduce one more axiom, which is independent and consistent with the previous 82 rules, and which is such that we can now answer the question of interest. But, now we shall have a new system with 83 rules to which the theorem of Goedel will again apply. So, the theorem says that now, there will be another question, which cannot be answered yes or no using the 83 available axioms. Again, we can add a new axiom, which is independent of and consistent with the previous 83 axioms, such that all these taken together, enable us to answer the question at hand. But, the theorem of Gödel will apply again. Now, there will be yet another question that cannot be answered by using the 84 axioms available now. And so on, ad infinitum.

Now, at any point of time, all of Science taken together can be regarded as a system S such as above. The laws of Science will be the axioms of the system. Now, Gödel's theorem implies that there will be a question that cannot be answered with the use of the existing laws. The scientists, at this point, may discover a new law, which will be a new axiom added to the system. But, there will now be another question which cannot be answered. This process will continue on forever. Even after billions of years of research, there will be questions that will be left unanswered. Not only that, at that time, even though Science would have exploded to an unimaginable degree, the total amount of knowledge will be absolutely insignificant with respect to Reality as a whole.

However, the reader should be cautioned from jumping to the conclusion that the

scientific research will not be significant for us, because it can be (indeed, it already is) very significant. On the other hand, as a means of understanding Reality, Science and all its accomplishment compare to Reality essentially as zero is to infinity. Perhaps this insight prompted Socrates to say ‘I know nothing’, and Newton to say ‘I feel like a child playing pebbles on the shore, while the ocean of truth lies unexplored before me’. It is not that these great men really knew little. Rather, they had a very large field of vision. Even though they knew a great deal, they saw that their knowledge was insignificant compared to the total vision that they had. This contrasts with the attitude of many ordinary people who have a very small vision. They think they know a lot. Even though they know little, to them their knowledge seems big compared to their total field of view.

This limitation on the intellectual approach has far-reaching implications. For example, suppose we ask the question: does God exist? Recall from the last section that the answer to any question depends upon the context. Thus, all such ‘proofs’ of existence or nonexistence of ‘God’ are not absolute in any sense; it is not that they tell the ultimate truth. They tell some conditional truth, conditional to the context in which they are formulated and discussed. Gödel’s theorem exposes the limitation of Science (which shall always consist of a finite sequence of axioms); any question asked in the scientific realm is also subject to the delineation of the context. Thus, Science in particular, and the intellectual approach in general, do not have the ability to fathom Reality too deeply. But, such ability does exist; it is often called ‘instinct’ or ‘intuition’ or ‘Direct Perception’.

2.4 CONSCIOUSNESS: DIRECT PERCEPTION

“Direct’ perception or cognition is the faculty of knowing without the use of rational process. It is analogous to seeing in the mountains through fog or drawing crude oil from the earth. Thus, suppose a person is standing on the top of a peak surrounded by fog. If he has good eyesight and looks intently, he may see glimpses of certain objects like valleys, roads, and buildings. Using his previous knowledge that he is in the hills, and using some logical analysis, he can figure out the topography around him. Here, the good eyesight corresponds to direct perception, and looking intently corresponds to hard work. In theoretical intellectual activity, particularly in deductive reasoning, this type of process occurs.

In the second example, if we dig at a particular place, then depending upon whether that place really does have oil, we may be able to obtain some crude oil. If we do obtain crude oil, then we send it to refineries which have standard methods of refining the oil to get some useful products. Here, obtaining the crude is analogous to conducting scientific experiments, where the question as to what experiment ought to be done (and how to do it) is often decided upon largely by intuition. Also, just as every place where one digs may not yield much crude oil, similarly every experiment that people may do may not give much useful information. People with more intuition can come up with more innovative experiments. To continue further with the analogy, after the crude is obtained it is put through a refining process which is a set of largely standardized procedures; this corresponds to the analysis of data from the experiments, which is often done in standard ways.

In the above two examples of intuition, the intuition may often be helped by the knowledge of the world around oneself. However, there is a third, greater, kind, where

the perception is much more direct in the sense that it appears to have no relationship with anything that is around. An example would be Einstein perceiving the theory of relativity including the contraction of time in a fast moving vehicle, an idea that goes totally counter to worldly thought. This is seen often in sages, great thinkers, genuine psychics, but it actually occurs among people at all levels, including ordinary people. However, in ordinary cases it mostly gets ignored because, unfortunately, people have not really turned their attention to spirituality as much as they should.

As Einstein said, ‘theory precedes experimentation’. In other words, theory comes from the so-called ‘metaphysics’, from the intuition of the scientist. Einstein did not go around the universe experimenting with galaxies, observing the results, and then formulating a theory suggested by the same.

The author would like to state that he has experienced ‘direct perception’ himself and knows dozens of people who work largely using their intuition. (See Srivastava (2006).)

Very stunning well known examples of direct perception of the third type can be easily found in the work of the great Indian mathematician Ramanujan. Thus, for illustration, Ramanujan says (See, Rao (1989)) that it is true that

$$(1/\pi) = 2\sqrt{2} [q(0)+q(1)+q(2)+\dots+q(n)+\dots\text{to infinity}],$$

where π is the usual ratio of the circumference of a circle divided by its diameter, and where (for $n=0,1,2,3,4,\dots$) we have

$$q(n) = x(n).y(n).z(n),$$

$$x(n) = (1103+26390n),$$

$$y(n) = (1/99)^{(4n+2)},$$

and, furthermore, where (a^m) stands for the mathematical quantity called ‘a to the power m’, and where the value of $z(n)$ (which depends upon n) is too complicated to be presented here. The point to note here is the strangeness of the numbers appearing, for example, in $x(n)$ and $y(n)$. It is totally mystifying to find numbers like 99, 1103, 26390 in the formula. No one could figure out so far any reasoning why numbers such as these would be involved in π in this way. Ramanujan died in 1920, but so far (until 2007) no one has been able to prove or disprove this formula. However, using computer, one scientist has verified the accuracy of this formula to seventeen million decimal places! Ramanujan used to say that the “goddess of Namakkal” inspired him with various formulae in his dreams. There is nothing here that could come from the five senses, nothing that came from any experiment, and nothing that any one yet could derive from deductive logical arguments. It is a perfect example of Direct Perception.

2.5 RANDOMNESS: ILLUSION CAUSED BY IGNORANCE

Since the 1920’s when Heisenberg announced the ‘Uncertainty Principle’ and Quantum Mechanics (QM) was put forward, many people (led by the physicist Bohr)

started believing that there is no deep Reality, that deep down things are happening in a more or less random fashion, and that we should talk about events more in terms of their probability of occurrence. This contrasts with 'Determinism' that says that everything that happens has a cause, and that the past, taken as a whole, determines the future. This means that if the past is sufficiently known, the future can be closely predicted. Adherents of this position, of course, do not agree with the probability camp. Well known among them is Einstein, who famously stated that 'The Lord does not play dice'.

We maintain that (1) Reality is deterministic, and (2) Randomness is an illusion caused in a deterministic world due to ignorance of some of the variables influencing the observations. We proceed to elaborate this fact.

We shall look at the situation from three angles. The first one concerns the non-uniqueness of the definition of probability for elementary simple events. The next one concerns some remarks on tables of random numbers. In the last one, we shall try to illustrate how randomness appears to arise when the situation is really totally deterministic.

The subject of probability theory can be quite advanced and difficult. However, it is mostly concerned with studies concerning the probability of complex events that are built out of simple ones. For example, suppose a baby is born to a Chinese person named Wong in a hospital named Duke. Wong is out of town and wants to know the probability that a boy is born. He is told by a friend that in the Duke hospital 37 children were born in the past one week out of which 10 were boys. He is also told by another friend that in Wong's town there were a total of 32 Chinese children born in the past one week out of which 18 were boys. According to the data from the first friend the probability of a boy is $10/37$, but using the second data it is $18/32$. In a sense, both are right; however, there is ambiguity, and there is no simple way to choose among the two. This ambiguity arises out of the fact that the child can be classified using two different frames of reference.

The best frame would be one in which only one baby is to be born, namely, Wong's baby; in that case the probability would be $0/1$ or $1/1$, which would be perfect. But, how should we find that frame? In the context of Quantum Mechanics, this means that the frame which Max Born implicitly used (and which has been adopted since then) may be only one of many possible frames. Perhaps, we do not know. The frame that is used does give nice answers, but these answers are within the frame. Are there other frames? Should the ship of Physics lay anchor in the foggy seas of Probability Theory (as it appears to have done at present), or should it find ways of moving forward? The latter requires that we admit that Quantum Mechanics is incomplete, in agreement with Einstein.

Next, we emphasize that the so-called randomness can arise even under totally deterministic situations. For example, many tables of random numbers are constructed using a totally deterministic technique. Indeed, we can completely predict what the n th number would be for every value of n . But we consider the numbers to be random for ordinary usage because we do not expect any pattern in them that would correlate with the usage. However, we shall have to be careful in using these numbers in unknown sectors of Reality.

Another important situation where randomness seems to arise (when the situation is totally deterministic) is where we are looking at a variable whose value depends upon many factors, but only a subset of these factors are included in the study. In such a

situation, even though all the factors included in the study have a fixed value, the value of the variable may still appear to jump from one observation to another. For a trivial example, take the variable z that depends upon the five factors (g, h, k, m, n) . Indeed, let us have $\{z = (gn - 8hm + 3kg + 5mn)\}$, and suppose we study the dependence of z on the factors m and n , ignoring $g, h,$ and k . Suppose further that we fix m and n at the levels ($m = 2$) and ($n = 3$), but allow $g, h,$ and k to vary between 1 to 4. Then, clearly, the value of z shall jump around. For example, when (g, h, k) take the values $(1, 1, 1), (2, 1, 3),$ and $(3, 4, 2)$, the value of z shall be 20, 29, and (-19) respectively. If we totally loose sight of the fact that z may depend upon other factors as well apart from m and n , then the fluctuation in the value of z (for constant values of m and n) would seem to be ‘random fluctuations’, whereas in truth the variation occurs in z for purely deterministic reasons. In the above example, the factors (independent variables) $g, h,$ and k are often called ‘hidden variables’.

In Physics, many people have satisfied themselves that Bell’s Theorem (along with the experiments by Clauser, Aspect, etc.) has shown that there are no hidden variables in Quantum Mechanics (which is supposedly ‘complete’), contradicting Einstein, Schroedinger, Bohm, etc. However, as shown in Srivastava (2004-5), the paradigm under which the experiment is analyzed using Bell’s theorem, appears to be incorrect. It seems that Einstein’s assertion that Quantum Mechanics is ‘incomplete’ is correct, and a new paradigm should be pursued. We shall come back to this point later.

2.6 METAPHYSICS, RELIGION, SCIENCE, AND SPIRITUALITY

Here, ‘Spirituality’ would not refer to spirits and ghosts, and not even ‘religion’, though almost all religions do involve spirituality in varying degrees. ‘Religion’ shall refer more to rituals and belief-systems (often having partly legendary roots), and involving features based on traditional and social norms of places where they grew. *Basically, Spirituality shall refer to an attitude which does not regard ‘materialism’ as the be-all and end-all of human life, and which requires a rational and intelligent interest in all of Reality (also called Nature, in a narrower sense), and also requires behavior that is consonant with the same.*

To elaborate, all of what is commonly called Reality may be divided into two parts: Lower Reality, and Higher Reality. Lower Reality is that which, at any particular time, lends itself to a satisfactory scientific study (or at least is believed to be within the range of Science at the said time). Higher Reality is the rest of Reality, and is often referred to as ‘Metaphysics’, which is supposedly that which is ‘beyond ‘physics’, or beyond the reach of Science. This assertion itself has a fundamental error in it which we proceed to explain.

Suppose I say that I have a hidden object called ‘zing’, and no one would be allowed to know anything about. Next, I ask: “Is this object knowable?” The correct answer is not “No”, but ‘Possibly’ ”. The reason is that any object (call it Z) about which we currently know nothing at all, and about which we currently do not see any way as to how we could ever know some thing should, nevertheless, be not called ‘unknowable’, because it is possible that in the future we may begin to see ways to make it knowable. As an example, suppose 2000 years ago someone had asked as to how the ground on the moon looks. Such a question would have been dismissed as silly, because at that time

people would have thought that it is impossible to go to the moon. But, in 1969, Man was actually able to carry out this feat. This shows that one should not jump to the conclusion that something that is not known now is certainly also not knowable in the future. Thus, the claim of the so-called 'positivists' that 'Metaphysics' is unknowable is erroneous and unscientific. Hence, their assertion that Metaphysics should be rejected is unscientific and wrong.

Moreover, many important aspects of Higher Reality have come to be known to many people through 'Direct Perception' and through personal experience. In modern Science, 'repeatable experimentation' is considered to be a requirement for obtaining valid inferences concerning scientific phenomena; indeed, this is supposed to provide 'objectivity' to the study of the same. On the other hand, some of the very greatest men that the world reveres have walked the spiritual path, and though they were in diverse circumstances, in different epochs of time, and in different geographical areas of the world, most of their conclusions and assertions concerning Higher Reality are very close to each other. Thus, in a sense, 'repeated observation' has occurred already in metaphysics, and in that sense, we may state that 'Spirituality' offers experience that can be repeatedly obtained. Indeed, because Spirituality deals with the entire Reality and Science deals only with the Lower Reality, one would agree with great scientists such as Pribram (2002) and state that "Science is a part of Spirituality".

The word 'materialism' shall refer to the attitude that Lower Reality is all that one ought to be interested in; it is the belief that either there is no 'Higher Reality', or the same (even if it exists) is permanently inaccessible to humans. As stated above, both of these attitudes are untenable.

Spirituality, as defined above, has not really been rejected by any thinkers. On the contrary, loosely speaking, some of the very greatest philosophers, scientists, and other thinkers have, in various ways, expressed themselves positively in this regard. Indeed, Einstein said that a person who has not experienced spirituality has wasted his life. What has often been rejected is the product of religious belief-systems, involving particular notions of what 'God' is.

Incidentally, in this paper, 'The Divine' shall stand for a totally unconditioned entity, an entity about which a 'condition' cannot be really talked about, an entity that is above concepts and cannot be described as existent or nonexistent, real or unreal, true or false. The word "God", as is customarily used in religious discussions, often would not qualify to be called 'The Divine'. For example, if we say that God cannot be a person, or cannot be in an object, or cannot be impersonal, or cannot appear to be many, in each case, the restrictions that we put would not qualify such a 'God' to be 'The Divine', Who is unrestricted.

Notice that the above condition (which says that 'The Divine' is subject to no conditions) implies its own negation. What this implies is that, as is true of Reality in general, 'The Divine' can be looked at only through some lenses, some context, some perspective. Otherwise, 'The Divine' cannot be even considered. The point is not that we have to first define 'The Divine' and only then we can proceed. The point is that we first take the 'spiritual leap', and let 'The Divine' do the defining to us.

Notice also that, in a sense, the usual definitions of God that the different religions use are subsumed under 'The Divine'.

It is important to clarify this matter here. Historically, Spirituality arose in the minds of great men because they had a direct glimpse of the nature of Reality. Slowly, disciples came to these men. The disciples learnt this spirituality and understood and absorbed some of it within themselves, but by and large they tended to mix it inextricably with the personality of their teacher. When the teacher died, quarrels developed among the disciples not only because some of them competed to become the main successor of the teacher, but also because of differing interpretations of what they thought the teacher had taught. This often resulted in the disciples separating out, some of them starting their own sect or group. Some groups succeeded more and others failed more, often not because of their spiritual competence but because of their worldly abilities.

Slowly, ego came into picture: 'My teacher is greater than your teacher'. In due course of time, some teachers put the fear of God in the minds of their students, often so that the students become more disciplined and obedient. As time passed, some unscrupulous teachers used this fear to threaten their flock that if one does not obey them then the wrath of God may follow. Thus, the rule of authority developed.

Some teachers and/or their students wanted to have bigger flocks, and so the students tried to bring more people in. Whole populations were converted to this or that sect. These things happened in different parts of the world, and many different religions arose. All these religions competed with each other in the worldly sense. The spiritual message of the fathers of the religions remained on the back burner.

Since Spirituality corresponds to Reality, the greatest sages of different religions and sects were talking of the same thing. Later on, this became the basis for many people to say that all religions teach the same things. However, this was also misinterpreted. People did not understand what aspect of their religion is the great thing. Most of them looked for this greatness in the worldly aspects of their religion, because it seemed to them that this was the thing that was responsible for the success of their religion. Thus, Spirituality got pushed further back.

The scenario that is sketched above is, of course, an oversimplification. As we all know, a lot of wrongdoing is going on in the current world in the name of religion. Indeed, some are finding religion to be an obstacle on the spiritual path. A new slogan is: "God without religion!" (For example, see Saranam (2005).) However, the spiritual urge still sprouts in the heart of most people.

In the next section, we launch a discussion of the nature of Reality. As stated earlier, a deeper understanding of the same would lead one to Spirituality.

3. FOUNDATIONS OF CONSCIOUSNESS AND REALITY: A FUNDAMENTAL THEORY

We present an outline of the theory TK, where T stands for 'Theory' and K for the 'Knowledge', the 'Knower', and that which is to be 'Known'. Different sectors of the theory are classified below as TK1, TK2 etc. Recall from sec. 2.3, that every approach to Reality is only under some perspective; so is this.

(TK1) There does exist a deep, deterministic, Reality. When the context of discussion is scientific or physical, rather than logical or philosophical, Reality will sometimes be referred to as 'Nature'.

(TK2) Reality consists of logical-mathematical objects only, and all logical-mathematical objects are parts of Reality. These logical-mathematical objects exist on their own, induced by their own 'action' upon each other. There are 'two' basic entities, 'The Divine' and 'The Reality'. (Again, the word 'two' is a matter of perspective; we can call them 'one' by regarding the latter as an expansion of the former, or the former as a condensation of the latter.) Both of these are beginning-less, and independent of time and space; how these arise will be elaborated below. New logical-mathematical objects can be created by the 'Will' of The Divine only.

(TK3) Reality consists of two kinds of entities: 'Animate', and "Inanimate". The animate entities are (in a sense) conscious of themselves (including their own consciousness); they are also conscious of some other animate and inanimate entities. The inanimate entities do not have consciousness. In case two or more inanimate entities happen to be in the 'same' logical-mathematical plane, they interact with each other according to the logical-mathematical rules that define that plane. The animate entities may have a physical body (denoted by X), but they always have a psychic body (denoted by W). The animate entities are conscious only of a part of Reality, which is determined by their X and W.

(TK4.1) All logical-mathematical objects are in the realm of ideas only in the sense that they are not tangible things like material objects. (For example: the number '3' is not made of any solid, liquid, or gas; an equilateral triangle is an idea independent of time and place; the set of rotations of the two axes on the graph paper is merely a concept that does not have even a simple geometric expression; etc.) However, animate entities perceive (some of) these logical-mathematical objects (which are ideas) as physical or material objects.

(TK4.2) What kind of physical object they perceive a particular logical-mathematical object to be, depends upon their W and X. We illustrate this with examples, the first using the sight aspect of consciousness, an aspect which many conscious entities on the planet earth do possess. Two balls (one of which is green and the other red) will be seen as green and red by a human, but only as two different shades of gray (like in a black and white picture) by a lion. Light corresponds to an electromagnetic wave, and color corresponds to the wavelength of this wave (considered as a mathematical sine-function, which is probably the logical-mathematical object in this case); however, the consciousness is different for these two observers (the lion and the human) because their bodies (the X's, and the W's) are different. *This clearly shows that the attribute of being 'green' or 'red' or 'a shade of grey' is not in the ball; it is in the eye of the beholder.*

(TK4.3) Similarly, under the sound aspect of consciousness, we can have a situation where one conscious observer (i.e., one animate being) is not conscious of some aspect of Nature while another one is. An example is a sound that is very shrill; a human may not be able to perceive this sound, while an insect may. In the field of smell, we can take a human and a dog; the latter may be able to smell blood in a bush, while the former may not. (Incidentally, this shows that it is not true that humans have more consciousness than all animals in all aspects, as is sometimes believed.) *These examples illustrate that there may be things in Nature which are in the neighborhood of a conscious being which may not be a part of the realm of consciousness of this being. In particular, we humans are only partially conscious of Nature, even parts of it that are 'near' us.*

(TK4.4)*The examples in TK4.2 and 4.3 support our statement in TK3 that the consciousness of an animate entity depends on its X and W.*

(TK4.5)Obviously, the assertions in TK4.1-TK4.2 directly impinge on Quantum Reality. Firstly, we are saying that the so-called ‘material’ or ‘physical’ world is, deep down, a world of logical-mathematical objects only; as explained above, these objects are in the realm of ideas only. But, unlike Plato and Berkeley who may have made similar sounding assertions, the assertion above has scientific ‘teeth’ in it; in other words, whereas Plato and Berkeley did not tell how (in their world of ideas) the ideas combined with each other, we do tell that precisely.

In TK3, we asserted that the logical mathematical objects interact with each other according to the rules of logic and mathematics. This implies, in particular, that they will interact if they are defined in the same plane. Thus, recalling the discussion in sec.1, every molecule of zinc does not interact with every molecule of sulphuric acid (although both are logical-mathematical objects); they interact only when they are ‘together’. Indeed, putting them ‘together in the same test tube’, for example, could constitute their being in ‘the same logical-mathematical plane’.

As an analogy, notice that a south-north straight line does not intersect necessarily with a west-east straight line; they do intersect if they are together in a plane that contains these two directions. On the other hand, a straight line may not intersect with a rectangle even though they are in the same plane, simply because they stand separate from each other; an example would be a tennis court and a nearby road. This would be similar to replacing zinc by granules of glass; even though these granules are mixed with the acid they won’t interact, because the logical-mathematical structure of glass and of the acid are such that they stand ‘separated’.

(TK4.6) In continuation of the above, we assert: *“Under TK, every physical phenomenon is actually an interaction between logical-mathematical objects that happen to be in the same ‘plane’; a part of this plane happens to be included under our consciousness, and gives us the perception of the phenomenon that we are observing. The nature of this perception depends upon our consciousness, which in turn depends upon our own ‘definition’ (i.e., our W and X) inside Reality. As W and X change from one animate entity to another, the perceived phenomenon (or the lack of such perception) also changes. We provided some examples of this fact above in our discussion of the experience of color by a lion, and sound by an insect, etc.” This obviously implies that TK must have an important paradigm to offer for Quantum Reality. Of course, it does, and we shall come back to it in the next section.*

(TK 4.7) Inside Reality, in general, two logical-mathematical objects (if they are defined in the ‘same logical plane’) interact instantaneously, unless they are specifically restricted to a plane where ‘time’ exists, and where there is a limit on the ‘speed’ with which they can mutually interact. This will be elaborated further in sec. 4.3d, under [TK:T6.2] part (iii).

(TK5.1) We now briefly explain the concept of a set for the benefit of readers who need it; others may skip to the next paragraph. A ‘set’ is any collection whatsoever of any objects, there being absolutely no restriction on what objects can be inside a set. Thus, we can talk of the set of ‘all fish in the Pacific’, or ‘all the words in this article’, or ‘all ideas in my mind plus all the cars in London plus all my shirts that are more than a year old’; and so on. A ‘subset’ of a set is a collection of some of the objects that are in

the set. For example, a subset of the set of ‘all words in this article’ is the set of words in this article which contain at least five letters. Note that a set may be considered as a subset of itself. Also, every set has a subset that is empty; this is called the ‘empty subset’ of the set under consideration. The empty subset of the set of ‘all words in this article’ is the subset of this set which does not contain any word from this article; notice that we cannot say what else *this* ‘empty’ subset does or does not contain.

(TK5.2) Consider Reality as a whole, Consider a set inside Reality, denoted by V, such that V has the following property. Firstly, V is a subset of every possible set that exists in Reality; secondly, given any set (say G) inside Reality, V does not have any element of G. Thus, for example, suppose G is the set of all men who live in Berkeley, then V is a subset of the set of men who live in Berkeley, but at the same time V does not have in it any man who lives in Berkeley. Hence, V is a part of the empty subset of the set of all men who live in Berkeley.

(TK5.3) Also, in place of referring to the set of ‘all men in Berkeley’, we could refer to any other set such as for example ‘all words in the play Hamlet’, ‘all fish in Lake Superior’, ‘all planets in the solar system’, ‘all languages that I know’, and so on. Thus, V does refer to every possible set, but it is a part of the empty subset of every such set. In other words, given any set (whether conceivable or inconceivable by us humans), V is inside that set but is empty with respect to it. Hence, V is often called the ‘Totally Empty Set’.

(TK5.4) Since, V is a subset of every set, V can (in a sense) be called ‘omnipresent’. Also, because we cannot describe all the sets of which V is a subset, V is (in a sense) ‘indescribable’. Thus, we may say that V is ‘beyond concepts’. Now, Goedel is reported (Wang (1988)) to have said: “Mathematics is the study of the subsets of the empty set”. Thus, since TK2 says that Reality consists of all logical-mathematical objects and only of such objects, we can say that Reality or (Nature) is the ‘nature’ of V (where, the word ‘nature’ is used here in the usual sense, like ‘Psychology is the study of human nature’). In Srivastava (2003), it was shown that, under the logical-mathematical set up, we can assert that “V ‘corresponds’ to ‘The Divine’”.

(TK6) ‘Consciousness’ is a basic presence in Reality, like ‘Space’ is in what is popularly called the ‘physical universe’. Notice that in the usual notion of the physical universe, space refers to emptiness; as, for example, in the statement: ‘we shall empty this room of chairs and thus make some more space’. Thus, in the physical world, wherever we have emptiness we have space. Similarly, it is asserted, coherently with the above, that the logical-mathematical world (which is what Reality is, by TK2) is ‘filled’ with ‘Consciousness’ wherever it is ‘empty’. Because V refers to total emptiness, we assert that V corresponds to ‘total’ consciousness. Also, because V corresponds to ‘The Divine’, we assert that ‘The Divine’ is (in a sense) conscious of all of Reality’.

(TK7.1) Consider now an animate entity E. We make many assertions here which we shall examine later. At the most basic level, the entity E is existent because of its individuality, called the ‘ego’. Now, Reality is a logical-mathematical world and, therein, the ‘ego’ acts like a ‘container’ does in our physical world. Notice that the physical world has ‘space’ in it as a basic presence, and the walls of a container limit the space contained inside that container. Similarly, the logical-mathematical world has ‘consciousness’ in it as a basic presence, and the ego of E limits ‘the consciousness possessed by E’.

(TK7.2) It is asserted here that “ $E=E(V, W, X)$ ”, which is a mathematical

symbolism for saying that “E depends on V, W, and X”, where W and X are respectively the ‘psychic’ and the ‘physical’ ‘bodies’ of E. As mentioned earlier, E shall always have a psychic body W in the sense that if W is not there then E would be V. In other words, one of the aspects of E that W represents is the individuality or ego of E.

(TK7.3) Now, from the last paragraph, recall the analogy between our physical world and the logical-mathematical world. Consider again the container in the physical world; as noted earlier, the wall or the boundary of this container limits or defines the amount of space which is inside the container. Also, we further note that the space inside the container can be further decreased by putting things inside the container. Thus, if I have a jar that is empty, then it can hold a certain amount of water. But, if we put some stones in the jar, the amount of water that it can contain will decrease.

(TK7.4) Similarly, in the logical–mathematical world of Reality, the individuality of E acts like a container. Such an E shall have a certain amount of consciousness; however, this amount will further decrease if we put certain ‘restrictions’ (which, of course, shall be logical-mathematical in nature). Such ‘restrictions’ are also components of W. When E stands for a human, the restrictions W consist of (among other things) the logical system by which E analyses information, the desires, attachments, and aversions of E, etc. As asserted earlier, the physical body of E also influences the consciousness of E (for example, a human and an insect relative to a shrill sound).

(TK8.1) We assert that the consciousness of an animate entity E exists independently of time and space, though, of course, it can deal with time and space as well. A loose analogy would be to compare E with a live radio, in which case the physical machinery of the radio would correspond to X, and the electromagnetic wave which is playing through the body of the radio to V (which is the origin of the consciousness of E). Also, W may be compared to the talk-show-program itself that is being played in the radio.

(TK8.2) We also assert that X and W may keep changing, each influencing itself and the other. The physical body X will be subject to the laws of the sub-universe of Reality where E lives. If this sub-universe is endowed with a notion of ‘time’ as we know it, the body X may be subject to decay and death; like it is for us humans.

(TK8.3) After the death of the body X, W stays constant and has the ‘value’ W1, where W1 is what W was at the last moment in the life of X. Note that, as stated in (TK8.1), the consciousness of E (which depends on W and X) transcends the body X; at the death of X, it depends on W1 only.

(TK8.4) If W1 has certain features, such as unfulfilled desires, then W1 gets attached to and ‘dwells in’ a new body X1, which may be in the same sub-universe where X was, or which may be even in a different sub-universe. Now, again, X1 and W1 shall evolve as before, and the cycle will continue (unless X1 is in a world which is independent of time, in which case, X1 will not die and the cycle will stop).

(TK8.5) The cycle of birth and death will also stop when W has evolved to a state where it does not contain desires in it that need a body for their fulfillment. The stoppage of this cycle (due to lack of desires) shall be termed ‘liberation’. Until the liberation occurs, the animate entity E which constantly undergoes changes, experiences the sufferings of birth and death and/or the various ups and downs of existence with ego.

(TK8.6) Notice that if an entity E has attachment to something that is ‘worldly’, then E shall have the desire to be close to that thing in some sense. Similarly, if E has

aversion to something, then E shall have the desire of being not too close to that thing. Thus, E shall have to rise above attachments and aversions before desires can go away. Thus, before liberation can occur, one shall have to reach a state of indifference towards personal worldly gain or loss. (Notice that this does not mean that one should become action-less in the world.)

(TK8.7) It is also clear from the above that as W ‘decreases’ (due to the reduction of desires etc.), the consciousness of E increases. As W approaches ‘zero’, the consciousness of E will approach that associated with V.

The assertions in TK1-8 provide a certain picture of Reality. This picture is, of course, subject to the general remarks in section 2.

The next section contains a discussion showing that a basic paradigm for Quantum Reality implied by TK is more appealing than other theories; it may be skipped by readers not interested in Physics.

4. COMPARISON OF THEORIES OF QUANTUM REALITY: WHY THE NEW PARADIGM IS MORE APPEALING

4.0 INTRODUCTION

The main purpose of this section is to validate the basic axiom of TK, namely, that Reality consists of logical-mathematical objects alone, and that all such objects are a part of Reality. As emphasized in TK 4.6, this axiom suggests a major paradigm for Quantum Reality. In this section, we shall discuss this very briefly in the light of the eight major theories of Quantum Reality (mentioned in Sec. 1), and show that this paradigm is more appealing. This fact, along with the further discussions in the coming sections, offer solid support to the theory TK. Theory T1 currently is accepted by the majority of people, and T2, T7 and T8 are offshoots of the same. T2 and T7 involve Consciousness. T6 contradicts T1 in major ways. (For more details, See Srivastava (2004-5).)

Besides what is discussed in this section, there are other aspects of Quantum Physics (like the Casimir Effect) that support TK; that will be skipped here for lack of space.

4.1 SOME IMPORTANT EXPERIMENTS RELEVANT TO QUANTUM REALITY

(4.1a) THE 2-SLIT EXPERIMENT. Consider a board (denoted by S) which is square in shape, and whose corners are denoted respectively by A, B, C, and D. We shall have occasion to refer to S from many angles in the coming sections. Let SB denote a board that is to be used as a barrier in the sense that light cannot pass through it except by making a hole in it. Let SS denote a similar board which is to be used as a phosphorescent screen. Let O be a source of light, in front of which SB (and then SS) stand parallel to each other. Suppose SB contains two slits (denoted by g and h), which are in the same plane as O.

It is seen that if only one slit is open, then a certain pattern is formed on the screen SS. From this, one would expect that if both slits are open, then what we will observe on the screen will be the sum of the two patterns: this expectation being based on the assumption that light consists of particles (called ‘photon’). Instead, what is observed is a

different pattern which is a result of interference of light waves coming through the two slits; of course, this would happen if light is a wave rather than a particle.

On the other hand, suppose I put a detector d_g in front of the slit g , and d_h in front of h . Now, suppose light is made to trickle down one photon at a time. It turns out that each time only one detector registers a photon; both detectors never register a photon at the same time. This shows that light moves as a particle when it does not have a screen (like SS) on the back where the rays coming from the two slits could meet; but, when there is such a screen then it moves as a wave. So, somehow, when it starts from O then it 'knows' whether there exist two slits or not and whether both are open or not.

(4.1b) THE 3-POLARIZER EXPERIMENT. Consider 3-dimensional space with mutually perpendicular axes x , y , and z . There is a source O ; consider light coming from O and moving in the direction y . Consider the board S again, but now assume that it is made of plastic and has the property that it polarizes light vertically; to emphasize this, such an S shall be denoted by S_v . Suppose S_v is standing in front of O in the xz plane, with the side DC in the bottom, AB at the top, where AD and BC are the two vertical edges. Now suppose we rotate S_v clockwise by 90 degrees (keeping the corner C fixed); in this case it will be denoted by S_h (where h stands for horizontal), and its side CB will be on the bottom with DA at the top. Finally, take S_v again, and rotate it clockwise (at the corner C) by 45 degrees; in this case it will be denoted by S_d (where d stands for the diagonal), and the diagonal AC will be along the z -axis, and DB along the x -axis.

Now, let S_v stand in front of O , and a distance further let there be S_h ; notice that vertically polarized light does come out of S_v , but it is stopped by S_h since S_h would polarize horizontally. So, there is no light that comes out of both S_v and S_h .

Next, S_d is put between S_v and S_h , and it is found that now light does come out of all three; i.e., it goes through S_v , then S_d , and then S_h , and comes out.

The paradox is this. In daily life we find that if there is an object in front of O through which light can not pass, then by adding more objects light should still not pass. But, in this experiment it does.

(4.1c) THE EINSTEIN-PODOLSKY-ROSEN PARADOX: THE ASPECT EXPERIMENT

The theory of Quantum Mechanics (QM) was founded in the mid-1920's, but many controversies were there, some of which linger on till today. An important milestone was a thought experiment due to Einstein, Podolsky, and Rosen (EPR) who, in a paper in 1935, seemed to provide arguments that contradict some basic features of QM. This EPR paradox could not be checked for a long time. But, later, Bohm gave a more concrete form to it, which led Bell to obtain a theorem which could be used to test it. The first experiment in this regard was done by Clauser in 1972. In 1982, Aspect did a much more sophisticated experiment which is considered to be conclusive by many. We describe the same very briefly.

Consider again the polarizer S_v from the last subsection. Consider rotating it clockwise at the corner C by an angle q ; the polarizer so obtained shall be denoted by S_q . Thus, S_v , S_d , and S_h correspond to $q = 0, 45$, and 90 degrees. In an obvious manner we can allow anticlockwise rotation too, so we shall assume that q lies between (-90) and 90

degrees. We shall consider two such pieces, to be called detectors (denoted by D1 and D2); assume that these, respectively, correspond to $q = q_1$ and q_2 .

Consider the following (oversimplified) situation. The source O is in the middle, light travels in both directions from O along the y-axis, D1 (or Sq1) is in the xz-plane at a distance d_1 from O, and D2 (or Sq2) is on the other side of O at a distance d_2 (and also on the xz-plane).

Now, in this experiment, O is not just a simple light source; it is a birefringent calcite crystal that can emit a pair of photons (say, P1 and P2 respectively) which are in the 'twin state'; this means that if q_1 and q_2 are equal, then P1 passes through D1 if and only if P2 passes through D2. When q_1 and q_2 are unequal, and q^* equals the difference between q_1 and q_2 (subtracting the smaller of the two from the larger), then QM says that the proportion of cases where P1 and P2 shall both pass through the respective detectors equals a number r , where r depends on q^* only. (QM gives a formula by which r can be determined from q^* .) When the actual experiment is done a large number of times, the observed proportion of cases where both P1 and P2 pass through their respective detectors is seen to converge to r , thus showing QM to be correct.

On the other hand, Bell's theorem (derived under the usual paradigm that photons are going out from O to the detectors, and that nothing can move at a speed faster than light) leads to an arithmetic inequality which is contradicted by the result of QM. *From this, many in the physics community have concluded that the 'locality assumption' (concerning the speed limit assumed by Einstein) is incorrect.*

(4.2) THE TK PARADIGM FOR QUANTUM REALITY

(4.2a) There is a certain differential equation involving complex numbers (i.e., numbers which involve the square root of -1) which is basic in QM; any solution of this equation is called the Schrödinger Wave Function. This function will here be denoted by WF; in any given situation, it is not necessarily unique. It is a function of a 'space' variable (say, x) and a time variable (say, t).

(4.2b) According to TK, a WF is really a marginal feature (like a shadow) of the Real WF (RWF), where x is a set of many dimensions. Agreeing with Einstein, TK says that QM is incomplete and we should attempt to investigate the RWF. Depending on the context, the phrase Quantum Cloud (QC) will often be used to refer to the RWF, particularly when many particles are under discussion.

(4.2c) TK says that any change in 'space-time' (in the context of which the Schrödinger's equation is being considered) affects the QC instantaneously. Also, what we actually observe depends only on the QC.

(4.2d) Recall that, under TK, Nature consists of logical-mathematical objects only. These objects interact with each other in a completely deterministic fashion according to the laws applicable in the sub-universe where they are defined. Randomness is not there in any intrinsic sense; it only appears to arise because we are ignoring hidden variables.

(4.3) COMPARISON OF THEORIES

(4.3a) THE PRESENTATION.

(i) We now compare and contrast the eight theories of QM mentioned earlier; these will be denoted respectively by T1,...,T8. In what follows, we shall present within curly brackets ({}) assertions made by the proponents of a given theory; the corresponding answers shall appear in square brackets ([]). Also, an assertion shall be denoted by a symbol like, for example, {T6. 2}, which shall mean assertion #2 under theory #6. The response to this under TK shall, in an obvious notation, be denoted by [TK:T6.2].

(ii) Furthermore, using a term due to Herbert (1985), all fundamental particles shall be called quons. Thus, quons include electrons, protons, neutrons, and the rest.

(iii) Any act of any measurement on a quon will be called an M-act.

(4.3b) THEORIES T1 (Bohr, Heisenberg) AND T8 (Heisenberg)

{T1.1} There *is no* deep Reality. At the level of quons, things are happening randomly.

[TK:T1.1] There is a deep Reality, and it consists of all the logical-mathematical objects, which mutually interact according to the rules of the universe where they exist. Randomness is only an illusion (sec.2.5).

{T1.2} Prior to any M-act, each quon possesses some static attributes, but no dynamic attributes.

[TK:T1.2] Under the TK paradigm, it is improper to talk about quons before the M-act. We should talk about the QC that will potentially be generated by our preparations for the M-act. A quon does not necessarily exist before the M-act. An M-act may result in the formation of quon(s), but not necessarily so. Because a quon may not be there before an intended M-act, it is improper to talk about its attributes, not only the dynamic ones but also the static ones. When we prepare for an M-act under which we are going to measure, say, the momentum of a quon, we are firstly forcing the QC (which corresponds to our preparation for the M-act) to take a stand and produce a quon. On the other hand, if we create conditions where interference can occur, the QC is forced to display the wave aspect.

{T1.3} But, we see quons existing on their own quite often. Also, interference is noticed quite often.

[TK:1.3] As stated earlier, TK agrees with T1 regarding the dynamic attributes, but concerning the static attributes it goes further. It maintains that even a static attribute, like the existence of the particle itself, is a consequence of the QC which itself is a result of the preparation for the M-act. The preparation for the M-act creates an environment which creates the corresponding QC. Now, under TK, all things including the apparatus, the preparation and the M-act, are logical-mathematical objects which interact with each

other according to the rules of logic and mathematics. Thus, when we produce conditions where we are going to observe a quon in some way, then a quon does get created. However, these same logical-mathematical conditions could also get created on their own, uninfluenced by the action of a conscious observer. What seems to be happening is that the environments under which the QC would produce a quon occur in relative abundance; that is the reason why quons are observed on their own in Nature. Same situation occurs with respect to the interference aspect.

{T1.4} We find that two quons that seem to be identical in all respects end up giving different values for the same attribute. This shows that, deep down, we have an inherent randomness.

[TK:T1.4] In agreement with Einstein, TK says that Reality is deterministic, and that “God does not play dice”. As pointed out in sec. 2.5, randomness is an illusion that can arise in a totally deterministic context. The observed value of an attribute is a function of the M-act and the QC; it would be possible to predict the value of an attribute if the parameters of the QC are known in detail. *The current acceptance of the theory T1 by many in the Physics community has resulted in a stagnant situation. Investigations should be started under the TK paradigm.*

{T8.1} When a quon is not being subjected to an M-act, then it exists in a state of ‘potentia’. The potentia is a mixture of a set of possibilities in which the quon can be observed. When the M. act occurs, one of these possibilities becomes an actuality.

[TK:T8.1] It is difficult to imagine that the said mixture is a mixture of physical objects in the ordinary sense of the word ‘physical’. On the other hand, in the realm of ideas the mixture can exist as a bunch of separate ideas about the same thing. Thus, even though T8 seems to be far-fetched if the word physical is taken in the ordinary sense, it is viable under TK!

(4.3c) THEORIES T3 (BOHM), T4 (EVERETT), AND T5 (FINKELSTEIN)

{T3.1} Reality should be looked upon as a ‘Whole’; it is not a ‘sum’ of its parts.

[TK:T3.1] TK agrees with this, but goes much further. Recall from TK5 in sec. 3 that under TK, Reality consists of Nature, Consciousness, and The Divine; but, Consciousness is a property of The Divine and Nature emanates from The Divine. Thus, The Divine constitutes the Whole. Studying the parts is a discrete process; by Gödel type ideas and even otherwise, it is clear that such a study will never lead to the ‘Whole’. Thus, at the deeper level there is coherence between TK and T3.

{T3.2} The entanglement of phases of quons should be taken into account.

{TK:T3.2} TK agrees. But, the proxy wave theory of Bohm was premature. Indeed, studies should be done by considering the QC rather than the quons.

{T4.1} When an experiment is done, then corresponding to each of the possible outcomes of the experiment, a different universe gets created. In one of these universes, the experimenter is there; in the rest of them a replica of the experimenter is present.

[TK:T4.1] Suppose I throw a dice; according to T4, six universes will get created which are alike except that the dice will fall differently in each one of them. Now, if we keep believing, as most do, that 'matter' is not in the realm of 'ideas', but is 'concrete', then this theory seems to be utterly far-fetched. Even so, it does indirectly support TK, because the five universes with all the matter in them must then arise out of nothing! As it stands, it can be supported only under the basic assumption of TK that Reality is a world of ideas, and perception of physicality arises out of consciousness.

{T5.1} We can explain QM (particularly, situations like the 3-polarizer experiment) if we use a new logic (which, for example, does not use the distributive laws). The world of quons may be obeying a different logic.

[TK:T5.1] Under TK, the 3-polarizer experiment can be explained in a simple manner. All that is happening is that the space through which light can pass is different when Sd is used and when it is not used. The above statement T5.1 merely tells a property of some quons; it does not tell why the different logics arise. The problems are far deeper than what T5 can handle.

(4.3d) THEORY T6 (EINSTEIN, SCHRÖDINGER, ETC.)

{T6.1}(i) There does exist a deep Reality that is totally deterministic. (ii) Let us call an object 'ordinary', if it has some properties that do not depend upon whether it has been observed by a conscious observer or not; then, Reality consists of 'ordinary' objects only.

[TK:T6.1]TK agrees with (i). It also agrees with (ii) if the 'ordinary' objects are the logical-mathematical objects. However, as we exemplified, the consciousness of observers depends on their W and X. Thus, the attribute 'green' of grass is really an attribute of the observer; this shows that what T6 may call an 'attribute' may not be so. Again, quons are created by the situation we create; so they can't be said to retain attributes.

{T6.2} Consider the Aspect experiment which was started out by the EPR work. Where does TK stand on this relative to T1 and T6? What about the usage of Bell's theorem leading to the conclusion of non-locality?

[TK:T6.2] (i) According to TK, the analysis of the Aspect experiment using the Bell's theorem is incorrect. Even the talk of 'two photons move in opposite direction from O' is incorrect. The experimental setup does create a QC which changes as soon as (q1-q2) or d1 or d2 are changed. Because we cannot talk about 'photons moving out of O...', Bell's theorem is not applicable. Hence the conclusion of non-locality is not tenable. Indeed, the Aspect experiment supports the TK paradigm.

(ii) No communication is going on between the two photons of any pair. The different values of (q_1-q_2) , and of d_1 and d_2 , modify the space in which the QC is defined, which is what influences the outcome.

(iiia) According to TK, inside our space-time universe, there is a speed limit as given by Einstein which is to be obeyed by all moving objects. (Recall (TK4.7), Sec. 3.) But, inside Reality in general, for all objects independent of space and time, no such limit holds. As soon as any one of (q_1-q_2) or d_1 or d_2 is changed, the space available for the QC changes instantly; it is not that the information on the change at any one end of the available space goes to the rest of the space at the speed of light. This fact explains the Aspect experiment.

(iiib) We now elaborate the nature of the universe we live in, under the TK paradigm. Our universe is one of infinities of universes inside Reality. But, how is this so? We explain by using an example. Consider a computer program whose purpose is to display the play 'Macbeth' (by William Shakespeare) on the monitor screen. Consider the part of the play (towards the end) where a war occurs between Macbeth and Macduff. This war takes place in a battle field. To display this war, the computer programmer would create a 'field' on the screen (which would look like a battle field to viewers) where objects (like soldiers) would move; he would also assign a maximum speed limit to how fast such objects could move within this field. Notice that the computer commands that create this field are inside the overall computer program.

(iiic) Now, we can compare the overall computer program to Reality, and the battlefield with soldiers moving in it to the Universe we happen to be in. Just as inside the battle field the soldiers shall follow the imposed speed limit, in the same way inside our Universe, objects shall follow the parameters of the Universe, and the speed of light is one of them. However, just as in the overall computer program, the different commands can interact with each other essentially 'instantly', similarly in Reality as a whole, objects (not subject to time restrictions) can interact with each other instantly.

{T6.3} Under T1, measurement devices and M-acts are outside the rules of QM; T6 avoids this by saying that all objects are ordinary objects. Also, under T1, quons are not ordinary objects; if it is so, then where is the boundary between quantum objects and ordinary objects? Under T6, such major anomalies do not arise. Where does TK stand?

[TK:T6.3] Yes, T1 does get out of major difficulties implied by itself by giving a special status to various things, such as M-devices and M-acts. Also, the boundary mentioned in the question has been called the 'infamous boundary' (See, for example, Wick (1995)), because T1 or supporters of the same have not come up with any rational answer. Of course, under TK, no such assumptions or boundaries are needed.

(4.3e) THEORIES T2 (WHEELER) AND T7 (VON NEUMANN)

{T2.1} (i) Reality is created by an act of observation. (ii) No phenomenon is a real phenomenon unless it is an observed phenomenon. (iii) Only elementary phenomena are not real unless they are observed.

[TK:T2.1] (a) As is characteristic of T1, the associated theories suffer from the problem that they accord special status to some things without giving a rational reason. For, example, in (iii), what is the boundary between ‘elementary’ and the rest? Obviously, under TK, one does not have to struggle with such irrationalities.

(b) Suppose piano is played in one room and flute in another. A listener can go to only one room. So, his choice (whether he goes to one room or the other or none) creates Reality; in this sense, T2 is supported. However, to say that ‘the moon is not there unless observed by a conscious person’ (as has been stated by one theorist) is not supported by TK. On (ii), there is a difference in approach. Under TK, Reality consists of logical-mathematical objects, whose existence is not necessarily dependent upon time and space and which are perceived only by animate beings. So, in a way, T2 is agreeing with TK by ignoring the logical mathematical objects, and calling the perceived physical objects as real. In this sense, the observer creates Reality. But, TK goes deeper, and sees that it is the consciousness of the animate being which is only giving it a perception of Reality.

{T7.1} Theory T7, supported by Wigner, Stapp, Goswami, and Kafatos and Nedeau, involves Consciousness in major ways; it says that we measure the dynamic attributes of a quon, the value of the attribute that we get is dependent upon our consciousness.

[TK:T7.1] Under TK, a portion of Reality is perceived by our consciousness as the physical world. But, for the attributes of a quon, TK is closer to T6 in saying that the value of the attribute comes from the parameters of the QC. But, in agreement with T7, TK says that the perception of the quon itself is a result of our consciousness.

5. CONSCIOUSNESS: HOW IT ARISES IN A LOGICAL-MATHEMATICAL WORLD

In the last section, we argued why the TK paradigm is more appealing, and in sec.3, TK6-TK8, we discussed Consciousness under this paradigm. In Srivastava (2003), the nature of Consciousness is heuristically studied from logical-mathematical considerations; these derivations are too abstract and technical to be elaborated here. However, these derivations utilize the ‘self-reference’ aspect of ‘consciousness’ illustrated in sec.1.3-1.6 using the example of zinc and sulphuric acid molecules. We now present some further non-technical insights, continuing with the same examples.

Thus, we shall say that the molecule of zinc is ‘conscious’ of the molecule of sulphuric acid if and only if it is cognizant of the statement “I am cognizant of the molecule of sulphuric acid.” Now, though the molecules of zinc and acid are cognizant of each other, none of them appears to be cognizant of the statement that ‘one is cognizant of the other’. Notice that a world (say, #1) where the said statement lives must be outside of (perhaps, ‘inclusive of’) the world (say, #0) where the two molecules live, because the statement is about the world #0, and because a statement about world #0 cannot be talked about inside world #0. But, now, the two molecules are in world #1 and so a statement about them must be in a bigger world (say, #2), and so on. This leads to an infinite regress. Pursuing the above mathematically, certain results are obtained.; note that all such results and discussions are subject to the basics assertions in sec.2.

To discuss these results, we first introduce the concept of a ‘free object’ in Nature; such an object is one which is not confounded (recall sec. 2.1) with any other object, i.e., there is no object from which it can not be separated. (For readers who would like to have full mathematical precision and rigor, the author must apologize, because this paper is more for the ‘layman’, and is written in a heuristic style. For more precision, the word ‘free object’ will have to be further delineated; however, recalling sec. 2.2, we know that eventually we shall have to stop defining, and accept our ground from some perspective.)

The first result is that if K is a free object in Nature, then V (recall TK5) is conscious of K. Thus, ‘omniscience’ is an attribute of V. Notice that V is a member of every set, but it has no member of any set in it; thus V is not tied to any thing. Hence V is an absolutely free object, and thus V is conscious of itself. Obviously, V is cognizant of K. But, the statement “V is cognizant of K” is also obviously not confounded with anything; hence V is cognizant of this statement, and is ‘conscious’ of K. Note also that if we take any object, then this object is either inseparably tied to another object or it is tied to none; note that only V satisfies the condition of being tied to none, and hence only V is omniscient. This is one reason why we say that V ‘corresponds’ to The Divine.

Note that we do not elaborate what we mean by ‘corresponds’; that can be done, but only under a perspective (sec. 2.3). What The Divine seems to be depends upon the perspective taken. For example, even though V is not describable in a sense (because it is impossible to enumerate all sets to which it belongs), our definition does enable us to refer to It (He, She, They?). Taking this perspective (namely, that we are able to refer to It), we can say that The Divine ‘exists’; this corresponds to the belief in western religions and in most of Hinduism. However, we can take the perspective that V contains absolutely nothing, is nowhere, and hence is ‘non-existent’; this would correspond to the Buddhist view.

Clearly, the theory TK transcends even the disciplines of widely different religions. It is able to do so because even though the religions (and the sects within them) are different (being conditioned by the times and the places where they grew), the spirituality that they contain is similar. This is so even though, often, the spirituality is ‘different’ in the topics covered, the amount of coverage, and the emphasis; this ‘difference’, in turn being merely due to the different circumstances in which the great teachers happened to be teaching.

Notice that V does not involve any notions of time and space, and is independent of these. Thus, V is omnipresent and everlasting, without beginning and end, and immutable. So is Consciousness, which an attribute of V. Clearly, V has to do with ‘emptiness’. In a world of logical-mathematical objects (which are ‘ideas’ only), an animate entity E is like a vessel whose walls are made of the ego of E; the consciousness possessed by E depends upon how much of this emptiness is enclosed by its walls. Now, just as the amount of space (emptiness) inside an ordinary vessel gets decreased by putting objects in the vessel, in the same way, the emptiness inside the ‘walls’ of E is decreased by the presence of ‘logical objects’. For humans, such ‘logical objects’ include the ego, the desires, the attachments, the aversions, the psychology of the person, and so on. When we totally surrender our desire and our ego (“nevertheless, not my will, but Thine, be done”), we reach the highest.

Notice that, like 'space' in the physical world, 'consciousness' is one thing, one complete whole. In other words, just as 'space' is only one thing even though it appears to be divided among separate vessels, in the same way 'consciousness' is only one thing even though it appears to be divided among animate beings. Thus, the consciousness of an animate entity E also arises out of V. Hence, E depends upon V. But, in the case of E (unlike the case of V), the consciousness is restricted; these restrictions are denoted by W. Thus, E depends upon V, W, and X, where X is the 'definition' of E in the universe where E exists.

Notice that we have not stated precisely who is animate and who is not; this will have to be done by new research. What we provide here under the theory TK is the framework under which such research can be started.

6. SCIENTIFIC VALIDATION OF SPIRITUAL STATEMENTS

. 'Direct Perception' (sec. 2.4) is nothing but the experience of consciousness directly without an intervening logical mechanism. So, are psychic phenomena. (But, there is no implication here that every one claiming to be a psychic genuine.)

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THE END

Krishna Krishna or Rama Krishna Krishna

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