

Transtemporal Phenomenal Consciousness

Andrew Soltau

Abstract: Objectively, time does not pass, physics reveals no such phenomenon. While subjectively we find ourselves at a specific point in time, 'now', and we appear to pass from moment to moment, physics can accommodate neither of these concepts, thus there is no explanation of subjective transtemporal reality, or how an observation could possibly be made. A solution to the puzzle is proposed based on an analysis of the logical type of the system required to explain such subjective experience.

Relativity requires that we consider the dimension of time on a par with the spatial dimensions, thus making a block universe inevitable. The concept of change can be recovered by considering a sequence of definitions of the block universe, and thus the passage of time can be considered to be the change of this definition, resulting in a sequence of block universes as transtemporal reality. However, the unitary wave function must subsume all possible block universes, all possibilities exist 'already', thus there is no becoming. As Barbour explains, each moment in time is a complete definition of the state of the whole four-dimensional universe, the sequence of states being static like the frames of a movie on the film. Since nothing passes from moment to moment it appears impossible that there could be any such thing as time that passes; this would require something of different logical type to the moments to account for such a phenomenon, and the moments are all that exist.

What would be required is something that is to the moments as the projector is to the movie, something that contains all the moments and iterates the sequence. Clearly only the unitary system as a whole contains all the moments of any given sequence. Additionally, the only possible expression of the necessary logical type for an iterator is an emergent property of the system as a whole; only the system as a whole is of the correct logical type to change the functional frame of reference from one block universe to another, giving rise to the appearance of collapse described by Everett. Objectively this transtemporal process is the collapse dynamics, subjectively it is phenomenal consciousness passing through time.

Part One: The Transtemporal Observer

1 Introduction

The Everettian universe subsumes all possible actualities, thus as Saunders states “temporal relations are tenselessly true;” (1995,abs), in other words, all possible moments are 'there'. As Deutsch states, the multiverse is an existing, static collection of all of the possible moments, configurations of matter and energy which he refers to as 'snapshots' (1997,277). This straightforward analysis is logically applicable to any no-collapse interpretation where all possible moments or snapshots must exist as part of the system as a whole. Objectively, the Everettian universe is a simultaneity of all possible snapshots; there is no collapse, nothing changes. Thus in the no-collapse universe all possible moments in all possible universes exist 'already'. Yet subjectively, not only does an observer experience only a single configuration, a single moment or snapshot, at any given moment, the observer also experiences making observations and passing from moment to moment. Thus, as has been widely remarked, physics is unable to explain our basic experiential condition. As Mermin states, “Quantum mechanics offers an insufficient basis for a theory of everything if everything is to include consciousness.” (1998,7). Consciousness seems an unlikely solution to problems in physics, but on this view it is the key to the solution of the intractable problems of interpretation in quantum theory

The most acute problem is that of observation, which lies at the heart of the measurement problem. To make an observation the observer must change, effectively passing from one moment to the next; but this is impossible, as Deutsch states, “*Nothing* can move from one moment to another. To exist at all at a particular moment means to exist there for ever.” (1997,278). According to Everett there is only the appearance of collapse, thus only the appearance of observations being made, and the appearance of the passage of time. Given a static domain, there is only one possible way to generate the appearance of collapse, and passing from moment to moment, namely by changing the frame of reference from one moment to the next; as with a movie being shown, one frame after another is made to be the frame of reference of the present moment. Potentially this could apply to the no-collapse universe, providing the subjective appearance of the change in a static unchanging domain. In order to achieve this, however, there must be a mechanism which changes the functional frame of reference from one element of the

indexical array of moments to another. Thus what is required is something that is to the static array of block universe moments the way the projector of the movie is to the sequence of frames on the film, both having access to all the moments and iterating a sequence of moments. Leaving aside hypothetical agents outside of the multiverse, an oxy-moron anyway, the only thing in this position is the unitary system as a whole. Nothing less than the system as a whole has access to all of the elements of the indexical array in the way that the projector has access to all of the frames on the film. Similarly, only the unitary system as a whole is in a logical position to change the frame of reference from one index in the array to another, just as only a whole working computer system is in a position to change a pointer to address a different area of memory. On this view, the phenomenal consciousness of the observer is the subjective concomitant of this kind of change of the functional frame of reference through the indexical array. Subjectively, in the constantly shifting functional frame of reference, a 'four-dimensional movie' of matter and energy is enacted, a transtemporal reality of exactly the nature one seems to experience; collapse appears to occur, the time evolution of physical reality seems to proceed, and time passes.

A solution of this nature should not perhaps be entirely unexpected. As Mermin cautions, "The problem of consciousness is an even harder problem than the problem of interpreting quantum mechanics, and it is important not to confuse the two." (7), but on the view presented here it is exactly this confusion which has given rise to the paradox of the nature of time, and the measurement problem. It seems as if the two fundamental operational principles, the linear dynamics and the collapse dynamics, cannot coexist, but while the linear dynamics is the fundamental dynamics of the objective physical universe, the collapse dynamics is the dynamics of the subjective functional frame of reference which passes from moment to moment, and from linear dynamics to linear dynamics. As Everett shows, there is only the appearance of collapse, only subjectively 'in consciousness' is there collapse and change, but in this context the passage of time is experienced. Phrased in this manner it sounds as if the subjective is being elevated in significance beyond all reason, however, all that is being proposed is that the collapse dynamics is not only of different logical type to the linear dynamics, being the change to the linear dynamics, but also necessarily an emergent property of the unitary system as a whole; the subjectivity likely being simply an epiphenomenon of the exercise of the collapse dynamics.

2 Nothing Moves

Given that nothing physical can pass from moment to moment there is no possibility of a physical transtemporal observer. For many this possibility has already been abandoned: in view of the multiple parallel versions of each observer arising at every moment in a no-collapse universe, many commentators now simply consider that future versions of oneself are descendants rather than the same person at a later time. This conclusion seems inevitable in the no-collapse interpretations of quantum theory, where a single individual at any given moment inevitably has multiple descendants. It seems as if the only sensible understanding is that there is a multiple branching array of possible observer states, but nothing to connect them apart from the quantum logic relating the definitions of these sequential states. This, however, leaves open a

number of puzzles of increasing severity. Subjectively it seems entirely obvious that we are moving through time, but this can be ascribed to illusion. The meaning of probability is unclear, but progress has been made in this regard, viz. Deutsch (1999), Wallace (2003) and Saunders (2004). Observation, however, poses a far more fundamental difficulty. To make an observation is to change, and if there is no transtemporal identity, and nothing changes from one state to the next, there is no thing that actually makes an observation; little wonder then that the interpretation of probabilities has been problematic.

2.1 The Illusion

Deutsch (1997,258-288) analyses the multiverse into specific moments, each one a static layout of the matter and energy of the universe, which he calls a snapshot. As he makes clear, no physical entity can pass from moment to moment, every observer is part of a specific physical configuration, a specific matter and energy snapshot. Furthermore, although it seems so clear that one is passing through time from moment to moment, this is necessarily an illusion. This is entirely feasible because in truth we have only the evidence of existing at a specific moment. As Barbour states,

The sense we have that time has advanced to the present Now is simply our awareness of being in that Now. Different Nows give rise to different experiences, and hence to the impression that the time in them is different. (1999,44).

At any specific moment, the observer has the experience of that moment, and the memory of the past and the expectation of the future. In the next moment there is another version of the observer, the observer one moment older, and in that moment, for that different version of the observer, there is the experience of that moment and the memory of the past and the expectation of the future. As Deutsch states,

We do not experience time flowing, or passing. What we experience are differences between our present perceptions and our present memories of past perceptions. We interpret those differences, correctly, as evidence that the universe changes with time. We also interpret them, incorrectly, as evidence that our consciousness, or the present, or something, moves through time. (1997,263) .

In other words, all of the contents of one's subjective experience, including the apparent evidence of the passage of time, can be conclusively explained by the contents of the specific moment. The phenomenon of observation, however, remains unexplained.

An observation, meaning a sensory experience, can be explained by the contents of a single moment. This is a single specific datum and can be understood as 'the difference between the present perception and the present memory of past perceptions'. However, *to make* an observation is to change, from the state of not having made that observation to the state of having made it. One cannot make an observation at a specific moment, one can only complete the making of an observation at a specific moment; the making of an observation is inherently a transtemporal activity. Since there is no definition of a transtemporal observer this is a significant problem.

3 Transtemporal Reality

As Deutsch describes, all possible moments exist in a static array, thus successive moments of physical reality can be likened to the frames of a movie film as Barbour holds, each one an element of a permanent static layout (Folger,2000). A succession of moments defines a changing evolving reality, but a physical observer cannot pass from moment to moment, everything physical is part of a specific moment. Just as there is an image of the protagonist in each frame of the movie film, each frame portraying an incremental change of their position, there is a body of the observer in each moment of physical reality, each moment defining the matter and energy of the body in a different state. The motion picture is produced by changing the frame of reference, making one frame after another the present frame of reference. In order for there to be such a phenomenon in reality there would have to be something of the logical type of the projector of the movie film, it would have to be to successive moments as the projector is to the frames of the movie film, making one moment after another the functional frame of reference. Neither the body nor the mind as defined in any way by the body can possibly fit this requirement.

3.1 Many Minds

Albert & Loewer (1998) get around this problem in their interpretation of quantum theory by proposing observers are minds rather than bodies, transcendental minds which have transtemporal identity. However, this requires not only a strong mind-body duality, but also a transtemporal mechanism which is not explained. Although a strong mind-body duality is a well aired concept in philosophy, the cognitive and psychological functioning of the mind is now generally understood to be readily explained in terms of the physiology of the body. As Chalmers shows, cognitive and psychological properties of the mind are logically supervenient on the physical, and the possibility of reductive explanation is “a straightforward consequence of the functional nature of psychological concepts” (1996,46). To believe otherwise is to believe that intelligence and mental functioning cannot be explained in terms of the physical body, which is the opposite of the findings of physiology and cognitive science; as Campbell states “for explaining events in the brain, physiology is, in principle, complete” (1970,52). Thus, with a single highly significant exception, all the properties of mind are explained in principle by the functioning of the neuro-endocrinal system of the body, and in this case, the mind is every bit as constrained to a single moment as is the body. The exception is phenomenal consciousness, but on this view this is not a part of the mind, but the context of the mind. Nonetheless, as will be shown, with a slight shift in perspective Albert & Loewer's interpretation provides an elegant solution.

3.2 Information Process

While the mind as a separate entity residing in a body, and thus being capable of somehow passing from moment to moment, seems problematic, the mind as an information process readily makes sense. At each moment there is a structure of information instantiated in the neural

network of the brain, and the process formed by the sequence of states of the system is precisely what we consider the mind in operation to be. If one considers the observer as a process rather than a physical entity the problem appears to be solved. It is clear that there is a sequence of bodies, containing a sequence of formulations of sensory experience, and the sequence of these experiences would be a transtemporal experience of reality. However, such a sequence demands an explanation of what it is that is experiencing that sequence. In order to experience a sequence of moments the experiencer must pass from moment to moment, or access moment after moment. Once again something impossible is required if the experiencer is to be a human observer. However, although the specific nature of the experiencer of experience is a longstanding puzzle, an analysis of subjective experience provides a clue to the solution.

The experience of a specific moment is a specific structure of sensory information, which, naturally, is part of that moment, as is the mind and the body. Each experience seems to be experienced by an internal aspect or property of oneself, an experiencer which experiences each moment, but there is no trace of something of this nature in the brain. This experiencer is the one thing missing from the physiology; no amount of functional analysis leads to an explanation, and neuroscience has no answer. Subjectively, it seems as if this experiencer passes from moment to moment, and this would certainly resolve the puzzle, but since we cannot explain the experiencer this is no help. We can say that this experiencer is consciousness, but in and of itself this takes us no further forward. As Deutsch sums it up,

When we say that our consciousness 'seems' to pass from one moment to the next we are merely paraphrasing the common-sense theory of the flow of time. But it makes no more sense to think of a single 'moment of which we are conscious' moving from one moment to another than it does to think of a single present moment, or anything else, doing so. Nothing can move from one moment to another. (1997,263)

4 Consciousness

The term consciousness is used for many different properties of the individual, but the concept is greatly simplified by Block (1995), who groups these properties into two very different classes of mental phenomenon, access consciousness and phenomenal consciousness. On this view, access consciousness is the mechanism whereby information in the mind is accessible; examples are the mental processes of reasoning, recall and introspection; thoughts, moods, emotions and dreams are often classified as consciousness of this nature. Everything in this classification has a satisfactory explanation, in terms of functional analysis if not direct evidence in neuroscience; everything about access consciousness is well understood. The other kind of consciousness in this classification, phenomenal consciousness, is subjective experience itself, pure subjectivity, the experiencing of any and all mental states. This, it seems clear to Block, is an entirely different kind of thing to any mental state, and Chalmers (1996,106) clearly demonstrates that this is the case. No satisfactory explanation has been developed to explain this phenomenon.

Phenomenal consciousness would seem to account for the sense of an experiencer. As well as having a mind, with all my thoughts and feelings and memories, the processes of access consciousness, I seem to have, or be, an experiencer which experiences my thoughts and feelings, and witnesses the recall of memories; an experiencer which experiences the changing contents of the mind, the access consciousness. This subjective experiencing is the effect of phenomenal consciousness, but we still know almost absolutely nothing about it. There is no trace of such a thing in the brain, “One cannot find consciousness by any conceivable histological examination of the brain” (Velmans,1995). As Chalmers shows, this is the one thing to do with the mind which cannot be explained in any way by physiology, and has no functional or reductive explanation; as he states, “The failure of consciousness to supervene on the physical tells us that no reductive explanation of consciousness can succeed.” (1996,106). Clearly, as he shows in his rigorous analysis, this implies that we cannot deduce a physical explanation of the type of consciousness to which these statements are referring, the phenomenal consciousness.

Subjectively, it seems obvious that the phenomenal consciousness sees mental states come and go; it is, it seems, to successive mental states as the projector is to the frames of the movie film. Subjectively, therefore, it seems as if phenomenal consciousness is of exactly the correct logical type to account for one's experience of the passage of time. But this appears to be self-contradictory, for if phenomenal consciousness is a property of the observer, it can no more pass from moment to moment than can the body itself. The consciousness of the individual is something specific to a specific observer at a specific moment. In so far as an explanation for phenomenal consciousness has been presented, it has been assumed that it is simply an emergent property of the living body-mind system, and as such it cannot be that which passes from moment to moment. The consciousness of a living entity is, naturally, the consciousness of that living entity at a specific moment. Thus the consciousness of that entity can experience that moment and only that moment; it is literally the consciousness of that moment. Just as there is another complete physical entity in the next moment 'already', there is the consciousness of that entity in the next moment 'already' also. The consciousness of each moment is a property of that body-mind at that moment.

5 Transtemporal Phenomenal Consciousness

In order for phenomenal consciousness to be to the moments as the projector is to the frames of the film it would have to have access to all the moments, just as the projector has access to all of the frames, and the whole problem is that there is no part or aspect of the observer that has access to anything other than the specific moment in which that version of that observer exists.¹ However, if phenomenal consciousness were an emergent property not of the body, but of the system of moments as a whole, it would be perfectly positioned to experience moment after moment, and reality would be exactly as it seems to us to be. This is closely akin to Chalmers' deduction about the necessary nature of phenomenal consciousness, which places it on a par with the fundamental physical properties of the universe.

¹ It has access to records of the past, but the records are of course part of the present moment.

I suggest that a theory of consciousness should take experience as fundamental ... we will take experience itself as a fundamental feature of the world, alongside mass, charge, and space-time. If we take experience as fundamental, then we can go about the business of constructing a theory of experience. (1995)

Here it is proposed that phenomenal consciousness is an emergent property of the overall system of reality, the Everettian universe, and is thus in an inherently transtemporal position. At a stroke this resolves a number of previously intractable problems, and while it invokes a new property of the unitary system, it requires no new structures or physical phenomena.

Although this idea seems absurd on a number of counts, each absurdity has a simple explanation. Firstly, it seems entirely obvious that the consciousness of an individual observer is necessarily a property of that observer, and not some outside agency, but there is nothing whatsoever to show that this is not the illusion. When one uses an immersive virtual reality, one quickly acquires the sense that one is actually in that reality. But if one looks in the mirror in that reality and sees the avatar, one's virtual body in that virtual reality, the consciousness is definitely not in that body! In the case of the virtual reality it is obvious that the experiencer is elsewhere. This is not to suggest that physical reality is virtual, only that the phenomenon of consciousness can be similarly 'elsewhere', and there would nonetheless be no hint of this in the reality itself. Naturally there would be no physical evidence of any kind for this phenomenal consciousness in physical reality, just as is in the virtual reality there is no direct evidence for the existence of the real body of the user; or the computer generating the virtual reality.

Secondly, as an emergent property of the unitary system, phenomenal consciousness must experience all possible experiences, not just the specific experience of a single observer; and all at once. However, while objectively all possible experiences must be experienced simultaneously, subjectively, in the experience of each one, there is only that specific experience. Each experience has a specific 'experiential value', just as each integer expresses a specific quantity; each experience is unique and singular. As Bitbol states, with respect to pure subjectivity which he calls Mind,

... as soon as (abstract) Mind identifies itself with a point of view, it can but identify itself to a particular one. However, this being granted, the mere insistence on the "particularity" of a point of view sounds artificial. Since no point of view is available from which all the other points of view would be seen as equivalent, the point of view Mind adopts, when adopted, is not one among others; it is the point of view, self-referred to as my point of view. (1991,8)

5.1 Everything and Nothing

The third absurdity is that, rather obviously, the whole system does not have a brain; the universe is nothing like a person or an observer of any kind. This, however, is falling prey to the idea that phenomenal consciousness is an emergent property of the physical brain, which we have absolutely no objective evidence for; indeed, quite the reverse, there is such an absence of physical evidence that phenomenal consciousness is purported to lie outside of existing physics.

As Mermin proposes, "... consciousness is beyond the scope of physical science, at least as we understand it today." (1998,7). Nonetheless, clearly our accustomed concept of the universe seems nothing like the right kind of thing to give rise to consciousness. The idea of a space-time of stars and galaxies giving rise to sentience seems plainly ludicrous. This universe, however, is only one tiny and likely infinitesimal aspect of the totality of all possible universes, the Everettian universe as multiverse, and this is not physical in the ordinary sense of the word. It is the simultaneity of all possible physical universes, thus it is total indeterminacy. Ascribing phenomenal consciousness to a cosmos of space and galaxies plainly is absurd, but ascribing it to the totality of all possibilities is an entirely different kind of concept.

We know that this 'entity', the totality of all possible universes, has some most remarkable properties. According to modern cosmology the net mass and energy balance of our universe appears to be zero. As Hawking shows the "negative gravitational energy exactly cancels the positive energy represented by the matter." (1988,129), and this accords well with the theory that the initial state of the universe begins with a single quantum fluctuation. Since all possible universes are considered to have a similar initial state, the net energy balance of each possible universe is similarly zero, and thus the whole of the multiverse of all possible universes would have a physical net sum of zero.

While each version of the universe may have a net energy balance of zero, a vast amount of information is instantiated in each one. However, as Standish points out,

... the collection of all possible descriptions has zero complexity, or information content. ... There is a mathematical equivalence between the Everything, as represented by this collection of all possible descriptions and Nothing, a state of no information. (2006,5)

Thus the multiverse, being the totality of all possible universes, also represents no information on net balance. Since at both levels there is an equivalence between the Everything and Nothing, one could say that the totality of all possibilities is nothing in a different form. The progressive evolution of each universe proceeds by symmetry breaking, and a logical extrapolation backwards in time to time zero² arrives at the void which gives rise to the initial quantum fluctuation. Thus the totality of all possible universes seems to be the broken symmetry version of nothing, which could therefore be seen as the fundamental nature of existence; perfect symmetry. Given such remarkable properties, ascribing the property of phenomenal consciousness to this 'Everything-Nothing' is hardly illogical. Since this entity is clearly entirely outside of the reach of both our science and our comprehension, ascribing to it the phenomenal consciousness of which we can find no trace in the physical world is no more absurd than not doing so. Of course, this does also mean that nothing passes from moment to moment!

Although the last statement is a play on words, in a way this peculiar paradoxical statement is precisely true. In all of this, one tends to think of there being something that does actually pass from moment to moment, but there really is nothing that does. This can be read as meaning that the Everything-Nothing does not move, and yet the moments are accessed in sequence, as a computer would play a movie from solid state memory; but the computer not only moves a

2 In ordinary time rather than Hawking's imaginary time.

pointer from address to address in memory, it passes the information to a screen to be displayed. In the experience of reality, nothing else happens except the experience of reality. There is nothing that experiences it, nothing except the system as a whole, which is the broken symmetry version of nothing. Objectively the system as a whole is the no-collapse universe, subjectively it is nothing, and there is nothing 'here' inside me doing the experiencing, there is just experiencing.

6 Logical Type

In order to make the ideas more accessible I have described the process as one of experiencing, but this is the subjective perspective of the underlying phenomenon, the indexical change of the functional frame of reference, the exercise of the collapse dynamics, which is on this view an emergent property of the system as a whole. That the collapse dynamics is meta to the physical is at first a very counter-intuitive idea, but this is what is required to give rise to a process of the correct logical type. Given that all of the moments exist in static array, iteration is required in order for there to be any transtemporal phenomena, and a transition through a succession of definitions of the linear dynamics is a process meta to the physical; the linear dynamics is the logical arrangement of interactions of the matter and energy in the space-time of the universe, and the change to this layout is of a different logical type to the layout itself.

A movie is of different logical type to the individual frames of the film, in Russell's terminology (1908) it is of different ordinality, being in functional terms the set of which the frames are elements. The projection of the film is of a different nature again, an iteration which operates on the set of frames. This is not literally a further difference in logical type in Russell's terms, but it clearly invokes an additional logical property over and above that of the film. The collapse dynamics is of this logical type. There is an additional dimensionality to the collapse dynamics, because there is an array of possibilities for the next step of the iteration at each point in the process rather than a single possible next step, in this regard it is more akin to the operation of a Turing machine. However, just like the projector, the iterated frame of reference simply follows the sequence automatically and 'blindly': while all the process instructions to a Turing machine are in the instructions in the machine, all the 'process instructions' of transtemporal reality are in the linear dynamics at each moment, in the form of the probabilistic definition of all of the possible next moments defined by the linear dynamics, defined in turn by the state of the universe at that moment. At each moment there is a range or spectrum of possible next steps in the probabilistic time evolution of the system, changes to the linear dynamics, defining all the possible next steps of the collapse dynamics in that functional frame of reference; thus all the possible logical pathways of transtemporal iteration are defined. Objectively all are experienced and thus the iteration is a branching process. Subjectively, in the experience of each branch, each branch the subjective reality of a specific observer, a specific observation is made. Thus the system produces an objectively branching dynamics in which each branch is subjectively singular, the exact logical type of the dynamics of the Everettian universe; as Everett states "... with each succeeding observation (or interaction), the observer state "branches" into a number of different states." (1957,459) .

The experiential perspective is used here to engage with an elusive concept. If there is to be an exercise of the collapse dynamics, it seems very much more in accord with physics to say that this occurs simply because quanta collapse, and that phenomenal consciousness is an epiphenomenon of this process. However, this makes it sound as if the collapse dynamics is exercised in the manner one ordinarily assumes, as a process of matter and energy causing the physical world to evolve in time, with no special characteristics or logical type. This, however, leads directly to the difficulties of the interpretation of quantum mechanics. Everett's solution is simple and elegant, there is only the appearance of collapse, but there can only be a change of this nature with respect to a frame of reference outside of any physical frame of reference. On this view it is simply the indexical location of the special frame of reference, the now, the moving locus of the meta frame of reference, which changes. This can only occur with respect to a position 'outside' of the moments, and thus the only possible solution is that this occurs with respect to a meta frame of reference, one which is an emergent property of the system as a whole. By addressing the issue from the subjective perspective of this meta frame of reference, the different logical types of the two dynamics, linear and collapse, are revealed naturally, although the use of the perspective in this context may seem absurd or surreal. However, what is intended is the emphasis of the meta frame of reference, rather than the epiphenomenon of phenomenal consciousness being causal.

The collapse dynamics as a process meta to the linear dynamics provides a simple resolution to the measurement problem. The linear dynamics is the objective dynamics of the physical, the layout of the probabilities of events in the linear four-dimensional framework of space-time. On this view the collapse dynamics is not only of different logical type to the linear dynamics, being the change to the linear dynamics, it is of a fundamentally different nature, and this is exactly what one would expect from the analogy of the movie film or the virtual reality; in all such cases the iteration is of a completely different nature to the layout of the structures which are iterated, just as the iterator is of a completely different nature to the medium that is iterated.

Similarly, access consciousness and phenomenal consciousness are of different logical types. There is a sequence of states of the mind, each one defining the structure of information being accessed at that moment, the information experienced at that moment, the contents of the subjective frame of reference. Clearly the sequence of experiences of the present moment is of the logical type of the frames of the movie. The accessing of these structures of information in sequence is the exercise of the collapse dynamics, which is thus of the logical type of the operation of the projector, and experienced by phenomenal consciousness, which is thus of the logical type of the light in the projector. All together this gives rise to subjective transtemporal reality just as the projected film gives rise to the showing of the movie. A meta frame of reference which is an emergent property of the unitary system as an operational whole solves the problem of the passage of time, revealing it as a phenomenon meta to the physical. This also provides the subjective appearance of collapse Everett proposes, and the exercise of probabilities. Transtemporal phenomenal consciousness can be seen as the epiphenomenon of the process of the changing of the functional frame of reference in the meta frame of reference or the cause. The latter seems quite feasible, since to make an observation is to make the transition from one moment to the next.

7 Duality

There is still a self-contradictory paradox remaining: the observer of reality has to be something which registers the observation, adding to the definition of itself the definition of the observation, and thus changing as the result of making the observation. Transtemporal phenomenal consciousness does not change any more than the light in the projector of the movie film changes. It cannot make observations, registering the observation and changing as a result; the system of which it is an emergent property is already all possible realities and all possible observations. The only entity in a position to register an observation is the body, and thus the mind, of the observer. But the physical body-mind does not change, only the definition of the body-mind in the changing functional frame of reference changes.

Neither the transtemporal phenomenal consciousness nor the body-mind of an observer constitutes a transtemporal observer, only in the juxtaposition of these two aspects of the observer, the experiencer and the experienced, does observation take place. Thus the definition of an observer must include both transtemporal phenomenal consciousness and a body-mind system which registers and records the structured sensory experiences it has produced; the latter being the basic process of access consciousness, the production of an accessible information structure, the observation that is experienced. Therefore the only possible observer of the passage of time is a composite entity having both temporal and transtemporal properties, both phenomenal consciousness and access consciousness. On this view this is the missing piece to the puzzle which has made the comprehension of the nature of the observer, and observation, so problematic. Subjective transtemporal reality is the phenomenon occurring in the juxtaposition of the inherent duality of access consciousness and phenomenal consciousness, that which is experienced and that which experiences the experienced. Each transtemporal observer is a phenomenon encompassing both. The result is observation as a process, the experiential life of the transtemporal observer.

On this view there is no mind / body duality, the mind is simply the information processing capability of the body, as is increasingly widely agreed (Anderson,1972,1). The radical differences between the subjective and the objective are explained by the duality of experiencer and experienced, phenomenal consciousness and access consciousness. It is not the physical and the mental that have different properties, but the experiential and the mental, it is a Mind / body-mind duality. This duality also resolves a further potential absurdity involving the observer, that 'I', as the experiencer, must be an emergent property of the totality. This 'I', however, is not personal, it is the very opposite, it is universal. It is only the phenomenal consciousness of the observer which is associated with this exalted identity; the access consciousness of the body-mind is personal, and the sequence of experiences experienced is personal, while the experiencer is universal. There is no clue to this condition experientially, because as Bitbol states “[abstract] Mind is by itself point-of-view-less, just as it is placeless and timeless” (2006,8). As he continues “Mind has no spatio-temporal location ... if It identifies itself to a given point of view, this implies that It adopts the whole associated memory content (9).

8 Probability

At each moment there is a multiplicity of possible next moments to experience, and phenomenal consciousness experiences all of them. Thus objectively the phenomenon is a branching process. Subjectively, however, the experience of each moment is singular. Thus while objectively all possible experiences are experienced, subjectively, in the experience of each one, there is only the specific experience of that structure of information. Objectively, physical reality in a no-collapse universe is like a river dividing and dividing, and objectively phenomenal consciousness is there in all versions of reality, so all versions of reality 'happen' and probability is meaningless, or at least obscure. Subjectively, however, from the point of view of the specific functional frame of reference of the observer at a choice point, probability is simply the likelihood of a specific version of reality being what happens next. The difficulty in the interpretation of probabilities arose because quantum theory seems to show that there can be no passage of time as Deutsch (1997,258-288) and Barbour (1999) explain. If transtemporal reality is a constant flow, with 'droplets' going one way or the other at every moment, then from the point of view of any specific droplet probabilities are exactly what they seem to be.

This is closely akin to Albert & Loewer's many minds theory, since all possible mental processes are experienced by the universal experiencer, and thus the 'droplets' can be seen as the subjective experience of minds which, as Vaidman states, "evolve randomly and independently to mental states corresponding to the different possible states of perception (with probabilities equal to the quantum probabilities for these states)" (2002). Albert & Loewer's theory holds that there is a continuous infinity of minds, and that each mind takes a specific pathway through time. If each mind, rather than being an epiphenomenon of the body, is taken to be a dynamic process or thread, each 'transcendental mind' a separate strand of the universal process, one thread of the iterative loop of observation, definition and observation experienced by transtemporal phenomenal consciousness, the theory seems complete.

Subjectively, each 'instance' of phenomenal consciousness is a 'my' consciousness, but each such instance is the same consciousness; Bitbol's Mind, of which he says "Its closest philosophical equivalents are Husserl's and Sartre's Transcendental ego; or, even better, Wittgenstein's subject which "(...) does not belong to the world: rather it is a limit of the world" (Tractatus 5.632)" (2006,8). It is the same consciousness in all of those minds simultaneously, though in each mind there is only the experience of that mind, and each mind is different. The idea of consciousness being a property of the whole universe seems absurd because it is clearly 'in here', it is entirely obvious that consciousness is personal, but this is exactly how it would be subjectively if it were an emergent property of the unitary system. Phenomenal consciousness is 'in' the mind of the observer just as the user of an immersive virtual reality is 'in' that reality. If we postulate that this 'unitary consciousness' is the epiphenomenon of the transtemporal process of reality, a sequence of indexical transitions from moment to moment, from one probabilistic definition to another and so on iteratively, probability is simply what it appears to be, the likelihood of a particular version of reality happening, subjectively. Objectively, this process is the collapse dynamics, subjectively it is transtemporal phenomenal consciousness.

Part Two: Transtemporal Reality

9 Everett's Observer

Although Everett describes a physical entity as a model of an observer, a mechanical automaton, he concludes his description by making the 'function of the memory contents' the sole causal functional process of the observer.

If we consider that current sensory data, as well as machine configuration, is immediately recorded in the memory, then the actions of the machine at a given instant can be regarded as a function of the memory contents only, and all relevant experience of the machine is contained in the memory. (1957,457)

Thus the functional identity of the observer is defined solely by the memory contents. Additionally, it is solely with reference to the 'state of the memory' of versions of the observer that Everett shows there is the appearance of collapse and the resolution of the measurement problem by requiring only the linear dynamics, 'pure Process 2 wave mechanics'.

Judged by the state of the memory in almost all of the observer states, the probabilistic conclusion of the usual "external observation" formulation of quantum theory are valid. In other words, pure Process 2 wave mechanics, without any initial probability assertions, leads to all the probability concepts of the familiar formalism. (462)

In other words, within the context of the linear dynamics there is an effective collapse dynamics, from the perspective of the functional identity of the observer defined by the memory contents. Subjectively, from this perspective, there is the appearance of collapse and change. The difficulty with this is that there can hardly be a functional difference between the subjective and the objective, since the former is instantiated in the latter, and therefore cannot possibly be functionally independent or different from it in any way. This is perhaps the central point on which "Everett's interpretation stands itself in need of an interpretation" (Healey,1984,591). The paradox is resolved by the logical type of the collapse dynamics, for while the 'probabilistic concepts of the familiar formalism' are defined by the linear dynamics, they are exercised by the collapse dynamics. Only in the indexical transition from one definition of the linear dynamics to another is there collapse and the exercise of probabilities. This requires a meta point of reference,

and the only possible expression of the correct logical type is an emergent property of the unitary system as a whole. However, given such a point of reference, the theory is logically complete.

10 The World Hologram

In Everett's formulation the integrated sum of the observations made is the functional identity of the observer. Such an identity seems appropriate enough for a recording device such as the automaton Everett uses as his example, but it seems grossly inadequate for the identity of a human observer. Naturally enough it defines the familiar subjective self identity formed from observations, however, as will be shown in the following sections, this identity not only defines the determinacy of every aspect of the real observer, it is also the only possible valid identity for an observer of a transtemporal reality.

The recording automaton defines only the functionality of a camera, it simply holds a record of all observations, but a human observer uses the observations made to formulate a virtual reality model of the real world. As Deutsch states, Imagination is a straightforward form of virtual reality. What may not be so obvious is that our 'direct' experience of the world through our senses is virtual reality too." (1997,120). The intelligent response to reality of a human observer is based on the organisation of the observations made into an accessible functional concept of reality. The human brain records all the observations made and forms a synthesis of this information, a representation of the world, the internally constructed subjective reality. This structure of information is intensely familiar to each observer, it is the reality this observer knows, the 'known world'; it is this structure of information that is accessed whenever one brings to mind any part of the world remote to one's immediate location. Since this structure of information is experienced as spatially distributed, while in fact being encoded in the neural network of the brain, it is effectively a hologram of the world known through observations, a three-dimensional image produced from 'flat' data. This 'world hologram' is a virtual reality constructed and maintained in the brain and updated with the addition of each new observation.

Naturally, this virtual reality has at its centre the definition of the body of the observer, the physical self identity. Just as the world hologram is the known world, this component of the world hologram is the known physical self. One identifies with the body as a whole, but one knows only that much of the body which one has observed. One observes the body not only externally in mirrors but internally through proprioception and enteroception, and these observations are added to the representation of the physical self in the world hologram, the self identity. Similarly one is aware of being a mind, but again one does not know the whole of one's mind. Neural network patterns are altered with each neural impulse, and associations and ingrained responses are built up as a result. The vast majority of this information is unknown by the individual; what one knows are all the mental properties one experiences, such as thoughts, feelings, memories and expectations, all of which are observations and are added to the self identity in the world hologram. This is the sum total of everything one knows oneself to be. This self identity, mental and physical, is built up solely of experiential information, observations; inevitably observations account for all of the individual's subjective self identity.

11 Universe Superposition

The world hologram defines the known world of the observer, but in an Everettian universe this same structure of information also defines the determinacy of the effective universe of this observer. Although the world hologram is solely a structure of information, it defines the determinacy of the physical environment of the observer, the effective universe, all else being indeterminate, and in this context the appearance of collapse in the no-collapse universe is straightforward and self-evident.

Inevitably, there are in this kind of universe a very large number of parallel realities which one could be in at the present moment. Every parallel reality having the same identical appearance to one's observations, and having given rise to the same identical appearance at all points in the past, is a parallel reality one could be in at the present moment. Since all of these parallel realities exist in the Everettian universe there is inevitably a real identical copy of oneself existing in each parallel reality. Furthermore, as Deutsch explains, there is no question about which of these copies one actually is, one is all of them;

If, aside from *variants* of me in other universes, there are also multiple identical *copies* of me, which one am I? I am, of course, all of them. Each of them has just asked that question, 'which one am I?', and any true way of answering that question must give each one of them the same answer. (1997, 279)

In Everett's formulation, the universe is a simultaneity of all possible variations of the determinacy of the universe, and all of these copies are not only coexistent but coincident. If the copies of the observer are truly identical this would mean that there is only one observer, existing in all of those versions of the world simultaneously, which would therefore be effectively superposed in the functional frame of reference of that observer. The physical bodies of these 'identical observers' are entangled with different versions of the world, thus they are not truly identical; naturally, however, their experiences are identical. Subjectively all these bodies are totally identical, thus one can say that there is only one experiential identity, a single world hologram, that is in all of these bodies. The universes these bodies are in are coincident, and since this structure of information is simultaneously present in all of these universes, the effective universe of this experiential identity is the effective superposition of all of them. As stated previously,

This 'universe superposition' is a philosophical device, not a causal explanation; it is a metaphor for the unlocalised nature of the Everettian universe, with respect to which indexical version of the universe an observer is in, for an observer present in many such versions. (Soltau,2008,2)³

3 Even if this does not hold objectively, to an effectively omnipresent experiencer there can be no indexical separation between versions of the universe. Effectively the world must be a platonic realm to this kind of consciousness; there can be no duplications, only a single instance of any specific structure of information. Thus although this structure of information is duplicated in a large number of universes, from the perspective of unitary consciousness it is a single structure of information that is experienced, and since it is in a large number of universes simultaneously, subjectively they are all superposed, and

11.1 Relational Quantum Mechanics

The effective superposition of all of the universes containing a specific world hologram gives rise to a reality closely akin to that of Rovelli's Relational Quantum Mechanics. In that interpretation, the environment of each observer is defined by, and only by, the correlations established between that observer and the environment. The environment is therefore indeterminate except where defined by the correlations record, the record of interactions or 'observations' at the physical level. Rovelli shows that this provides the basis for a simple reconstruction of quantum mechanics (1996,10), and Mermin quotes what he refers to as the Theorem on the Sufficiency of Subsystem Correlations⁴ showing that "Subsystem correlations (for any one resolution of the system into subsystems) are enough to determine the state of the entire system uniquely." (1998,8).

Although the world hologram is a record of only the sensory observations made by this observer, the sensory observations are nonetheless correlations with the environment; the environment must be, and can only be, such as to give rise to these sensory observations. The world hologram is thus the correlations record. Although the world hologram is the integrated sum of only sensory observations, the correlatum is nonetheless a physical environment, the universe superposition. This is the physical functional frame of reference of this observer, defined by a specific wave function, the superposition of all of the wave functions of all of the versions of the universe in which this world hologram exists.

As in Relational Quantum Mechanics, the physical environment is determinate only where observed; universe superposition provides a simple explanatory principle for this phenomenon. Since the reality experienced is the effective superposition of all possible physical variations of the universe commensurate with the existence of this structure of information, only two things are determinate, being identically the same in all of these variations of the universe, and all else is indeterminate. These are the world hologram itself, and the physical environment correlated with the world hologram, since all other aspects of the environment are the superposed sum of all possible arrangements of matter and energy in the world.

11.2 Experiential Identity

It seems obvious that one is a body, and that while one is also a mind, and possibly simply a world hologram, these structures of information exist in the body and are just properties of the body. While objectively this is unarguably the case, it is equally true that as an Everettian observer, as a world hologram, one is simultaneously in a very large number of bodies, thus in the functional frame of reference of the observer defined in this way the effective universe is the simultaneity of all of the universes in which these bodies exist. Since in this superposition there are bodies that have the same world hologram, but differ with regard to minor physical details of the body which have never been observed, only those aspects of the body which have been

the experienced reality is the effective superposition of all of them.

4 Referencing he cites Bergia, Cannata, Cornia, and Livi (1990), also stating that "This theorem must have been noticed early on, but the oldest statements of it that I know of are improbably recent."

observed are determinate, since only those aspects are identically the same in all of the universes in the superposition. The same is even true of the mind: the products of access consciousness are experienced in the sensorium, and the rest of the mind, unobserved, is unknown. Neural network patterns are altered with each neural impulse, and the vast majority of this information is unknown by the individual; what one knows are all the mental properties one experiences, such as thoughts, feelings, memories and expectations, all of which are observations and are added to the self identity in the world hologram. In the worlds of the universe superposition there are bodies with minds that have the same world hologram, but differ with regard to aspects of the mind which have never been observed, thus the mind is determinate only where observed also. Thus the functional identity of the observer as defined by Everett, the state of the memory defined here as the world hologram, is the only determinate operational identity in the context of his formulation. Sequential definitions of this identity experienced by phenomenal consciousness provide the only possible identity of an observer of a transtemporal reality, an ongoing, subjective, experiential identity.

11.3 The Dynamics

The inherent collapse dynamics is elementary, it is simply the addition of each new observation to the definition of the memory contents, the functional identity of the observer. At each moment the linear dynamics defined by the physical functional frame of reference of the observer defines a spectrum of possible next moments, which, naturally, subsume different possible states of perception, with the quantum probabilities for these states defined in that linear dynamics. Objectively, they all exist with equal status. Subjectively, in each version of subjective reality, only one of them happens. Subjectively, the making of a specific observation is experienced, and the functional frame of reference becomes the functional frame of reference of this observer a moment later, having made that observation. Effectively, the observation is added to the definition of the functional frame of reference. This is the transtemporal dynamics, which is of course the collapse dynamics, the effective change to the linear dynamics. The new version of the linear dynamics defines a spectrum of possible next moments, and the cycle continues indefinitely. This provides the appearance of collapse proposed by Everett, and it applies directly to the structure of information defined by the cumulative sum of observations he proposes as the functional identity of the observer. The result is an iterative information process, the subjective experience of a transtemporal physical reality. Objectively this process is the collapse dynamics, subjectively it is the passage of time. Neither can occur save with respect to a frame of reference outside of any ordinary physical frame of reference, only from the perspective of an emergent property of the system as a whole can such transtemporal processes exist.

12 The Nature of Time

Relativity requires that time and space are treated on a par, thus indicating that the universe is necessarily a four-dimensional block universe. This accords precisely with quantum mechanics

since the wave function provides a four-dimensional definition of the universe. At each moment, the quantum universe is a four-dimensional block universe, defined by the wave function, and the collapse of the wave function gives rise to the next moment, defined by a different wave function, and defining a different four-dimensional block universe. As Deutsch strongly emphasises, “Other times are simply special cases of other universes” (1997,278), in other words, other times in 'this' universe are simply other complete definitions of the whole of the universe with a special relationship to the universe of this moment, and they are “distinguished from 'other universes' only from our perspective, and only in that they are especially closely related to ours by the laws of physics.” (278).

The collapse dynamics is the change of the definition of the four-dimensional universe, the transition from one block universe to another, with the consequent change of the linear dynamics. The collapse dynamics exercises the probabilities defined by the linear dynamics, giving rise to actualities, and thus the change of the functional frame of reference, the transition from one four-dimensional moment to another. This simple analysis resolves the measurement problem very simply, but it is incompatible with relativity because there is no single four-dimensional definition of the universe; there is no universal simultaneity for all observers, and different inertial frames can have different definitions of the sequence of events. But if the effective universe of each observer is defined solely by the observations made by that observer, then the four-dimensional block universe moments are naturally in accord with relativity. Each block universe at each moment is the universe superposition, the four-dimensional definition of the effective universe of this specific observer at this specific moment, and since there is only a single observer in this functional frame of reference, there is only one simultaneity applicable; based on the observer's location and velocity there is only a single frame of reference with respect to which all events are ordered.

13 Multisolipsism

The relationship of the observer to reality and to other observers is unfamiliar, because, as in Relational Quantum Mechanics, each observer is in a different parallel reality. Functionally, the presence of other observers in the personal reality can best be understood as the presence of icons, in this reality, of other subjective realities, each one representing another personal parallel reality. As explained above, the observer defines the determinacy of the reality they are in, thus each observer is in a unique position in their reality, in a thoroughly solipsistic manner; other observers are determinate only where observed. But at the same time all observers are of equal status, each having this unique position in the reality they are in; I call it multisolipsism!

This is simply a relational quantum mechanics at the experiential level, based on a cut in the von Neumann chain at the level of experiential information, the product of access consciousness. As in Rovelli's theory, only the correlations with the environment are determinate, and this gives rise to a definition of physical reality which is different for each observer. There is no conflict with relativity because each observer is in their own fundamentally unique functional frame of

reference, with respect to both quantum mechanics and relativity. This is the power of any relational quantum mechanics, the situation is not only very simple, it is unified. The different frames of reference in relativity are simply the different frames of reference in quantum mechanics also. They are simply the different functional frames of reference, of the different realities, of different observers. Along with the inherent resolution of the Wigner's friend 'paradox', this is yet another strong indication that a relational quantum mechanics is likely the correct interpretation, however outlandish it looks to us at the moment. In the context of a relational quantum mechanics it is clear that the measurement problem is simply an artefact of the assumption that the collapse dynamics operates in the same context as the linear dynamics, the linear time dimension of space-time. But the collapse dynamics is not only of a different logical type to the linear dynamics, it is meta to the physical; it is a change in the functional frame of reference from one version of the universe to another, from one linear dynamics to another. This change can only come about with reference to a frame of reference outside of any ordinary physical functional frame of reference, only with respect to a reference point which is an emergent property of the system as a whole can such a change occur.

On this view Weyl's statement is basically correct. "The objective world simply is, it does not happen. Only to the gaze of my consciousness, crawling upward along the life line of my body, does a section of this world come to life as a fleeting image in space which continuously changes in time." (1949). More precisely, the world comes to life as a fleeting image in space-time, which continuously changes in 'collapse time'. 'Collapse time', the time evolution of the universe according to the collapse dynamics, is of the logical type of a movie film, the indexical array of a sequence of block universes, definitions of the disposition of matter and energy throughout the universe, which transtemporal phenomenal consciousness experiences in sequence. Objectively, all of the block universes exist as part of the universe of the unitary wave function, all are subsumed by the unitary linear dynamics. Nothing moves, nothing changes. As Barbour states, "There is no movement from one static arrangement of the universe to the next" (Folger,2000) . Objectively, a sequence of block universes forms a passage of time, but nothing physical can possibly move along such a passage, it is a static array; only subjectively can there be a transtemporal reality of a sequence of moments. The subjective transition from block universe to block universe is the appearance of collapse, the appearance of the passage of time. Thus attributing the passage of time to a non-physical, or more accurately meta-physical, phenomenon, very simply resolves the clash between the direct implications of physics and common sense notions arising from subjective experience.

Subjectively it is obvious we are passing from moment to moment, but physics shows that this is totally impossible, as Deutsch states, "*Nothing* can move from one moment to another ..." (1997,278). Both are correct, but transtemporal reality is not only a process of different logical type to the linear dynamics of the time evolution of the physical, it is a process inherently meta to the physical. Objectively, within the context of any given physical frame of reference, there is no passing from moment to moment, only from the perspective of a point of reference that is an emergent property of the system as a whole can there be a transtemporal reality. Subjectively, from this perspective, there is the appearance of collapse, and the passage of time, objectively there is no collapse, the no-collapse universe is static.

14 Conclusion

Quanta collapse, subjectively if not objectively, this is the nature of any transtemporal reality, and if we chose not to hold that this is a domain of transtemporal reality, we need to explain why the very fabric of which it is built is probabilistic, and why at the quantum level every aspect of physics turns on events. Failing such an independent explanation, it seems reasonable to assume that this is a domain of transtemporal reality, though how it operates has been elusive.

The collapse dynamics is the change to the linear dynamics, the transition from one four-dimensional moment to the next. Nothing physical can engage in or witness this change, nothing physical can experience the transtemporal. The passage of time exists, the collapse dynamics is the definition of the passage, but the physical is what defines the framework of the passage, it cannot move along it. As Deutsch states categorically “such a sequence of moments does not exist within the framework of time, it is the framework of time.” (1997,264). The two dynamics in quantum mechanics are the two logical components of reality of this type, a sequence of four-dimensional space-time moments. Each moment, each four-dimensional functional frame of reference, is defined by the linear dynamics, and the collapse dynamics is the transition from frame to frame, the iteration. Together they give rise to the active dynamics of the unitary system, the transtemporal sequence of frames of reference.

The missing piece to the puzzle is a point of reference, one with respect to which there could be change of the physical and dynamic definition of the four-dimensional universe, the change of the linear dynamics. This can only be a point of reference that is an emergent property of the system as a whole, a meta frame of reference. Only something which is an emergent property of the system as a whole is in a position to iterate the sequence of four-dimensional moments, just as only a whole operational computer in action is in a position to play a movie existing in memory as a static array of data. Transtemporal reality, the constant changing of the functional frame of reference from one moment to another, can only be a property of the system as a whole, but as Standish points out, the system as a whole, the Everything, the collection of all possible descriptions of a version of the universe, is mathematically equivalent to Nothing (2006,5). There is nothing 'there' moving the point of reference, and there is nothing 'there' doing the experiencing; the collapse of the state vector, the passage of time, and the transtemporal phenomenal consciousness are simply aspects of the system.

The observer is not simply a body, or a mind in the ordinary sense of the word. While there must be a physical body in which the observations are formulated, the observer must necessarily have a transtemporal component or property also, since observation is inherently a transtemporal process; to make an observation is to change, adding the observation to the definition of oneself. Thus both the different logical types of the access consciousness and the phenomenal consciousness are essential aspects of the observer phenomenon. Only in the juxtaposition of mind and Mind, access consciousness and phenomenal consciousness, is there the transtemporal process of experiencing, the making of observations. Using the term mind in a third sense, in the sense of to attend to, one could call this ongoing process of minding 'the mind', meaning the ongoing process of subjective experience, the experiential

reality, and this 'mind as process' has the properties of Albert & Loewer's many minds. Thus the full identity of a transtemporal observer is necessarily triune, involving the phenomenal consciousness and the access consciousness, and giving rise to 'mind as process', the process of experiencing reality. Each such mind is an information process in the overall system of the Everettian universe, defining at each point in time the determinacy of both the body and the effective universe of that observer. Since the phenomenal consciousness in juxtaposition to the access consciousness is an emergent property of the whole system, such minds are correctly described as transcendental as Albert & Loewer aver. The phenomenal consciousness can readily be understood as 'spirit', the literally metaphysical phenomenon in the light of which time passes and observers of transtemporal reality exist, thus the longstanding concept of the individual observer being body, mind and spirit is provided a fundamental validity in quantum mechanics.

All observers have 'their own' phenomenal consciousness, but at the same time every phenomenal consciousness is the same thing, just as it is light that illumines all possible physical movie frames. Phenomenal consciousness experiencing moment after moment is 'what it is like' to pass from moment to moment. It is the subjective experience of the transtemporal transition, the collapse of the definition of physical reality from one probabilistic definition to the next. This transtemporal process itself is meta to the physical, by definition, since the physical is the definition of all possible physical moments. That's life! That is the passage of time, the process defined by the collapse dynamics, of which the transtemporal phenomenal consciousness is the subjective concomitant.

References

- Albert, D. and Loewer, B.: 1988, "Interpreting the Many Worlds Interpretation", *Synthese* 77: 195-213.
- Albert, D.: 1992, "Quantum Mechanics and Experience", Harvard University Press, Cambridge.
- Anderson, P.: 1975, "More Is Different", *Science*, 4 August 1972, Volume 177, Number 4047, pp. 393–396.
- Bergia, S. Cannata, F. Cornia, A. and Livi, R.: 1980, "On the actual measurability of the density matrix of a decaying system by means of measurements on the decay products", *Foundations of Physics* 10, 723-730
- Bitbol, M.: 1991, "Perspectival Realism and Quantum Mechanics", available online at <http://philsci-archive.pitt.edu/archive/00001957/>
- Barbour, J.: 1999, "*The End of Time*", Weidenfeld & Nicolson, London.

- Campbell, K.: 1970, *“Body and Mind”*, Garden City, NY.
- Chalmers, D.: 1995, “Facing Up to the Problem of Consciousness”, *Journal of Consciousness Studies* 2(3):200-19.
- Chalmers, D.: 1996, *“The Conscious Mind”*, Oxford University Press, Oxford.
- Deutsch, D.: 1997, *“The Fabric of Reality”*, Allen Lane The Penguin Press, London.
- Deutsch, D.: 1999, “Quantum Theory of Probability and Decisions”, Proceedings of the Royal Society of London A455 3129-3137, (1999); available online at <http://xxxx.arXiv.org/abs/quant-ph/9906015>.
- Folger, T.: 2000, “From Here to Eternity”, Discover Magazine (December 2000) Interview with Julian Barbour.
- Hawking, S.: 1988, *“A Brief History of Time”*, Bantam Books, New York.
- Mermin, D.: 1998, “What is quantum mechanics trying to tell us?”, available online at <http://arxiv.org/abs/quant-ph/9801057v2>
- Rovelli, C.: 1996, “Relational Quantum Mechanics,” *International Journal of Theoretical Physics* 35 (1996) pp. 1637-78, Revised: arXiv:quant-ph/9609002 v2 24 Feb 1997.
- Russell, B.: 1908, "Mathematical Logic as Based on the Theory of Types," *American Journal of Mathematics*, 30, 222-262. Repr. in Russell, Bertrand, *Logic and Knowledge*, London: Allen and Unwin, 1956, 59-102, and in van Heijenoort, Jean, *From Frege to Gödel*, Cambridge, Mass.: Harvard University Press, 1967, 152-182.
- Saunders, S.: 1995, “Time, Quantum Mechanics and Decoherence”, Published in *Synthese* 102, 235-66.
- Saunders, S.: 2004, “What is Probability?”, available online at <http://arxiv.org/abs/quant-ph/0412194v1>.
- Standish, R.: 2006, “Theory of Nothing”, available online at <http://www.hpcoders.com.au/theory-of-nothing.pdf>
- Soltau, A.: 2008, “Universe Superposition, Relational Quantum Mechanics, and the Reality of the No-Collapse Universe”, available online at <http://philsci-archive.pitt.edu/archive/00004393/>
- Vaidman, L.: 2002, “Many-Worlds Interpretation of Quantum Mechanics” available online at <http://plato.stanford.edu/entries/qm-manyworlds>
- Velmans, M.: 1995, “The Relation of Consciousness to the Material World” *Journal of Consciousness Studies*, 2, 255-265, available online at <http://cogprints.org/246/0/velman11.html>
- Wallace, D.: “Quantum Probability and Decision Theory, Revisited”, available online at <http://xxxx.arXiv.org/abs/quant-ph/0211104>.
- Weyl, H.: 1949, *“Philosophy of Mathematics and Natural Science”*, Princeton University Press, Princeton.