

A Symbiotic Model of the Universe

By Brad Bowins, MD

February 1, 2010

**2200 Yonge Street, Suite 1700
Toronto, Ontario, Canada
M4S 2C6**

Email: brad.bowins@bellnet.ca

Abstract

Biological life is based on interconnectivity, interdependency, and symbiosis. Adopting a novel perspective, biological systems might reveal key processes of the universe they are derived from. It is posited that the universe is characterized by extensive interconnectedness and symbiosis. Space-time as a dynamic entity is engaged in a symbiotic relationship with the macro matter-energy world, and the quantum world acts as an interface. Space-time provides existence to matter-energy, and the latter provides space-time with high quality energy in the form of applied low entropy. The quantum world offers potentialities varying only in probability to the macro matter-energy world. Interactions derived largely from the four major forces of the universe actualize potentialities and in the process apply low entropy. Information regarding the actualized potentiality embodies the applied low entropy, based on information itself representing a highly ordered low entropy event. The quantum world transfers this low entropy to space-time and permanently stores the actualization record. Biological life as the ultimate entropy facilitator has a prominent role. This symbiotic model of the universe offers several advantages including—Explaining seemingly disconnected arrows of time, revealing why true time travel is not feasible while suggesting the presence of a precise recording of every occurrence, providing a unique way of conceptualizing dark energy and gravity, demonstrating how processes such as the speed of light represent crucial boundary conditions, opening the door to a possible linkage between science and spiritual matters, and proposing a manner of quantizing gravity based on the role of this and the other three major forces of the universe in actualizing potentialities.

KEY WORDS: Theories of everything, universe, entropy, information, space-time, quantum states, matter-energy, gravity, dark energy, symbiosis, arrows of time, time travel, potentiality, probability, actualizations.

INTRODUCTION:

Many of the fundamental processes integral to the universe have been well characterized by physicists and astronomers. However, linkages between these processes remain poorly understood such as with quantum states and gravity. A major reason for deficiencies in this regard is lack of a coherent unifying picture or the “Why” of the universe. It is extremely difficult to synchronize the various fundamental processes of the universe without such a unifying picture. Given the state of scientific knowledge a comprehensive picture can only represent conjecture, much as with string theory, an ambitious theoretical construct that might not be testable. However, these theoretical constructs can add coherency and hopefully generate testable hypothesis.

Approaching the “Why” of the universe from a perspective grounded in biological systems represents a novel approach, and one that might shed much needed light on the big picture. Although there is no absolute reason to assume that biological systems need reveal the realities of the universe, all too often science treats biological life as a universal fluke or even “chemical scum,” without attempting to discern if these systems might reveal any fundamental properties of the universe or contribute to a unifying theory. The perspective taken here is that biological systems are derived from fundamental processes of the universe and can provide a great deal of insight into how the universe is structured.

Biological systems are characterized by interconnectivity and interdependency. Removing a predator or herbivore from a given ecosystem has an appreciable effect on the overall functioning of the system. Beyond basic interconnectivity and interdependence individual entities routinely engage in reciprocal interactions referred to as symbiosis. For example, coral polyps contain algae (zooxanthellae) with both benefiting in several ways from the relationship. In terms of the universe there are several fundamental components, including but not limited to entropy, information, space-time, the quantum world, the macro matter-E world including biological systems, gravity and the other three forces (electromagnetic, weak nuclear, and strong nuclear). It is proposed that there is interconnectivity, interdependency, and even symbiosis involved in these fundamental processes of the universe.

THE KEY PLAYERS:

In some regards the universal ecosystem is easier to work with than biological ones because there are only a few major players as opposed to perhaps thousands or millions within a natural ecosystem. The key players in the universe are space-time, the quantum world, and the macro matter-energy world. Regarding the former there is no absolute space, no absolute time, but there is absolute space-time. Many entities and properties occur in pairs and space-time is a crucial one. It is helpful to conceptualize space and time as a constant product of the speed of passage through space and speed of passage

through time represented by the speed of light. Travel through space at the speed of light leaves no room for travel through time, explaining why there is no aging at the speed of light. To some researchers space-time is only a manifestation of gravity, and does not exist in its own right. Contrasting this perspective is the active nature and contours of space-time believed to exist at the incredibly small level of Planck-scale physics. In addition, given that space and time on their own have no absolute reality, space-time can assume different compositions changing in shape, size, and perhaps even the number of dimensions. Such flexibility in composition will make it difficult to characterize an exact nature, and in settings outside of our own universe space-time might assume different forms. Perhaps it is only the case that gravity makes apparent and/or influences the form of space-time within this universe.

The quantum world is another major player, and the realm of the truly odd at least from our perspective within the macro matter-E realm. It is the world of the very small, subatomic to atomic that comprises this realm. However, size is not the crucial distinguishing feature of this world. To understand the quantum world it is helpful to think in terms of shifting states, a difficult concept for entities embedded in a world of uniformity. All quantum entities exist in either a particle or wave form. The particle aspect occurs with creation and annihilation, both transpiring with interactions. The wave aspect occurs when there is no interaction present. Complicating the picture somewhat is the nature of these waves, in that instead of one wave there are superposed waves representing different states. For example, a west-facing electron might be comprised of north and south facing waves.

Superposed waves account for another major feature of the quantum world, namely that all states exist together and at once. This might be likened to how there can be countless perspectives on many issues in the macro matter-energy world. The superposed waves provide the different states. With an interaction one of these states comes to dominate by a process that is not fully understood. It might be that there is so-called collapse of the wave function for the particular interaction, or somehow the different waves funnel into one reality consistent with that interaction. The characteristics of the wave involved in the interaction stands out from the superposed waves representing other states. The quantum world can be viewed as a hybrid of possibilities that only crystallized into a definite reality when interactions occur. Some have likened this to there being multiple versions of every macro matter-energy object but this perspective does not reflect the distinction between the two worlds.

Given the superposed waves representing many or perhaps all potential states it is understandable that the information capacity of the quantum world is virtually infinite. In comparison, a macro level matter-energy computing system works on a binary bit model with on or off at each juncture. A so-called qubit for quantum bit allows for many states at the same time each representing a piece of information. Adding even greater capacity is the ability of each state to carry different portions of information. With the above

example of the north and south waves for the west-facing electron, the north one might carry 15% and the south one 85% of the information. Beyond the quantitative aspect, the ability of the many superposed waves representing different states to change into one with interactions, observations included, adds a qualitative information dimension to the quantum world. In other words, if all states existed with no distinction ever there is no variation possible in the quality of information. The quantum world is then characterized by an incredible information capacity both quantitatively and qualitatively.

Related to the wave and information features of the quantum world is a process known as quantum entanglement, whereby a change in one state of a given entity impacts on all the other states instantaneously regardless of distance. This property of the quantum world has been very challenging to understand, but is made easier by considering that for a given quantum entity all the potential states exist as superposed waves. These waves do not correspond exactly to physical parameters we are used to, and seem to occur in a configuration space represented in a different dimension. In this configuration space the correlation between entities is more relevant than physical space. Hence, if an interaction occurs with a quantum entity the superposed waves representing the different potential states of that entity will be altered regardless of the physical distance of separation. This process allows for alterations in the quality of information pertaining to a given quantum entity to occur regardless of physical distance.

Described as one of the most amazing properties to be found by James Clerk Maxwell, another key distinguishing feature of the quantum world is the sameness of any given entity. For example, every electron is the same as every other one that has ever existed or will ever exist. All fundamental particles like the electron are identical and can only exist in one form. The identical nature of these fundamental particles means they play the same role in any interaction. Based on this ability these particles are actually able to move backwards and forwards in time. Facilitating the entanglement and time travel features of the quantum world is the lack of any friction allowing for perpetual motion, impossible at the macro matter-energy level due to entropy considerations.

The third key player is the one that we are familiar with—The macro matter-energy world. Matter and energy are equivalent with the ability to shift from one to the other, and as such represent naturally paired states as with space and time. In a definite sense the quantum world is comprised of matter and energy, hence the term macro applied to this world. It has been said that the quantum world creates the macro world as in “It from bit” but the commonality ends where it starts in a sense. In the macro matter-energy world of biological life and other entities multiple states present at the same time are not a reality. There is only one actual state for any given entity representing a macro reality. Some propose that there are multiple universes in a sense with different versions of each entity corresponding essentially to how quantum states exist at the same time. Even if valid it could be argued that these parallel universes are irrelevant given that there

is no interaction with ours. For reasons I will make clear these different versions are impossible in a macro matter-energy context.

Another crucial distinction between the quantum and macro matter-energy worlds is that the correlation between entities aligns with physical proximity. For example, while attached to your body your hand is perfectly correlated with the rest of you. No lawyer has yet tried to defend a client on the basis of his hand fired the gun and not the rest of him. Once your hand is removed and taken away the physical proximity ends, and so does the correlation with both entities diverging. Your removed hand decays and your body lives. A way of formalizing this reality is that there is an inverse relationship between the extent of correlation between macro matter-energy entities and relativity variance—The more correlated the entities the less divergence in their courses and perspectives pertaining to other entities. For example, attached objects where there is a definite interaction must overlap in their course and how they view relativity variables such as the passage of time, position, and speed of other objects. If they are so physically separate that no objects intervene to establish some correlation their courses can diverge completely. They can also see the passage of time, position, and speed of other objects in a completely different fashion.

A further difference between the two worlds is that in the macro matter-energy world each entity is unique and sameness does not apply. Even identical twins have numerous differences such as regards the wear and tear on various body parts, thoughts, and psychological experiences. Based on the inescapable differences no entity can substitute for another backwards or forwards in time. A twin going to the past of his counterpart can never play the exact same role. Furthermore, based on aging changes the given person cannot even play the same role in his past or future.

THE KEY PROCESSES:

Some of the key processes involved in the universe include entropy, information, gravity and the other three forces. The concept of entropy arose from very practical efforts aimed at improving the efficiency of machines. It became apparent that to produce any work some heat must be lost to the surround or cold sink of the universe. Work requires energy to be put into a system and at the end of the day entropy in the form of heat must be paid to the surround. Spontaneous change does not require the input of any energy and heat does not have to be paid at the end of the day. From this very humble and practical start entropy has grown into a major concept that many such as Roger Penrose believe is crucial to the universe.

Entropy can be understood or viewed in different ways. One crucial aspect regards organization or order. There is an inverse relationship between order and entropy—Low entropy refers to a highly ordered state, while high entropy entails disorder. The energy entering a machine is ordered and provides the capacity for work, while the heat

discharged represents a more disordered state. Work itself can be viewed then as an ordered event. Another way to understand entropy is in terms of potentialities and actualizations. With low entropy there is potentialities as nothing has been actualized. The machine that has just received low entropy energy now has the potential to do work, and when the heat is discharged to the surround the work has been done representing an actualized event. The actualized work and heat discharge never goes back to pre-work and potential energy for it.

A key feature of the universe is that it proceeds from lowest to highest entropy as a natural course of events. At the so-called Big Bang the entropy of the universe was at it's lowest and it is proceeding to higher entropy ongoing. The natural progression of low to high entropy has been said to be only a statistical phenomenon in that there are many more forms of disorder than order, such as a book can only be ordered by page number but ripped apart there are countless ways the pages can rearrange themselves. However, the universe does proceed from low to high entropy and it does not necessarily have to. What would there be stopping some universe from only having one either low or high entropy state never changing? Or perhaps one low and one high entropy form with oscillations back and forth? The universe clearly moves in one direction and that is from low to high entropy.

Conceiving of entropy in terms of potentialities/actualizations provides valuable insights into the role of entropy in the universe. Everything proceeds from potential to actual, and never the reverse. You start out your day with multiple potential things that could occur and as the day progresses those potentialities narrow into actualized events. Although it is a wished for scenario we can never undo the actualized event and return to the potential. The actualized potentialities can never be erased. Furthermore, these actualizations are ongoing and not subject to a window of opportunity. We can never go back at all, and reverse what has occurred, even a fraction of a second prior. As pertains to the life of a biological entity birth, or perhaps even conception, represents a state of maximum potentiality and lowest entropy for that being. With aging there is progressive conversion of potentialities into actualizations, and overall fewer potentialities and greater actualizations. An elderly person does not have the same potentiality left as an infant, and has actualized many more potentialities as overall entropy increases. The universe likewise goes from maximum potentialities to increasing actualizations. For example, there were virtually infinite possible configurations of super-galaxies, galaxies, and solar systems that could have formed, but only some did actualizing the initial potentiality.

Information is another key process of the universe and one that relates very closely to entropy. In a very general sense order and disorder provide information about the state of an entity. More significantly, any change that occurs conveys information. The events in each person's day represent information. Every thought we have entails information. In fact information is an integral part of the universe and all changes

represent information. Each conversion of a potentiality to an actualization involves information. This information describes the actualized potentiality. Given that low entropy represents high potential and conversion to higher entropy involves actualizing a potentiality, information is produced by each and every application of low entropy and increase in entropy. A unique way of looking at this process is that the low entropy is carried in the information content, based on information itself being a highly ordered event. In essence, highly ordered low entropy might be thought of as being transferred to the information content when an event has been actualized. This process is somewhat similar to how work embodies the low entropy high quality energy enabling the work.

While at first glance gravity and the other three forces would seem unrelated to entropy and information there is a very significant linkage. Gravity is conceived of in terms of relativity theory whereas the electromagnetic, weak nuclear, and strong nuclear forces are known as quantum forces. Despite being quantum in nature the latter three forces have very definite effects on the macro matter-energy world, as does gravity. In effect this means that these forces promote interactions between matter-energy entities, and in the process actualize potentialities. For example, the strong nuclear force plays a crucial role in the nuclear processes in stars that in turn influence planets and other bodies. These actualized potentialities represent information. The four forces by promoting interactions in the matter-energy world are highly involved in the progressive actualization of low entropy potentialities to higher entropy actualizations with the change representing information.

The commonality of the four forces in terms of actualizing potentialities provides a viable method of linking relativity based gravity and quantum based forces. As currently conceived relativity and quantum theories are largely incompatible, much like psychoanalysis and behavioral theory are. In such a scenario it is useful to ask what they do have in common that can be objectified and focus on this entity. In the case of psychoanalytic and behaviorism the common focus is behavior. Likewise, with relativity and quantum theory as pertains to the four forces, it might be their promotion of interactions actualizing potentialities and in the process applying low entropy that needs to be focused on. Applied low entropy and/or actualizations of potentialities can be quantized. An interesting accounting process applies. Each time a spontaneous change occurs there is conversion from low to high entropy that we might conceive of as one quantum of applied low entropy. If low entropy is applied to maintain low entropy, such as in an organism ingesting low entropy high quality nutrients there are additional quanta of low entropy (or actualized potentialities), and one for each unit of low entropy applied. These quanta of applied low entropy and actualized potentialities might serve as a manner of linking quantum and relativity states.

Regarding the linkage of quantum and relativity theories the key problem concerns how to quantize gravity. The linkage of entropy and gravity affords a possible solution. Progression of the universe from low to high entropy involves the macro

matter-energy world with all the changes that transpire. Aside from general entropy gravitational entropy is prominent. With inflation immediately after the Big Bang matter-energy was evenly distributed representing a state of maximal potentiality as far as gravity is concerned. The homogenous nature of the microwave background radiation from the early universe supports there being low gravitational entropy. In contrast maximal clumping of matter-energy due to unopposed gravity represents highest gravitational entropy, consisting of all the gravitational potential being actualized. Gravity arises from the effect of matter-energy on space-time, and as it is commonly expressed matter-energy warps space-time creating a space-time “valley” that matter-energy entities slide towards each other in. Hence, gravity promotes interactions between matter-energy entities. It then plays a major role in the general increase of entropy in the universe. Gravitational entropy can be viewed as the component of the overall entropy increase arising specifically from gravity. It contributes a distinct component because gravity is always positive and attractive, whereas the quantum forces have positive and negative aspects canceling each other out. These quantum forces though do have powerful effects on macro-energy entities actualizing potentialities and applying low entropy. From this perspective gravity is similar to the quantum forces based on the actualizations of potentialities and applied low entropy that can both be quantized.

HOW THE PLAYERS & PROCESSES INTEGRATE:

The universe has been described as an entropy generator given the inevitable march from low to high entropy. Interactions between macro-energy entities arising from the four forces are instrumental in this progression. The potentialities associated with low entropy are actualized as entropy increases. While the arena for the progressive actualization of potentialities and associated low to high entropy is the macro matter-energy world, it is the quantum world that is crucial in so far as information embodying low entropy is concerned. In the macro matter-energy world there is uniformity probably based on the averaging of countless effects in going from quantum bit to macro it. On the downside there is no real permanence, or as it has been said the only permanent aspect is change. Biological organisms are continually undergoing change, as are non-organic entities, and there is no persistence of the same state.

In the quantum world there is seemingly little uniformity as all potentialities occur together, but there is permanence provided by the quantitative and qualitative aspects of the information capacity. The quantum world seems to make available to the macro matter-energy world all potentialities varying only in probability. Probability describes the chances of a potentiality being actualized. When one of those potentialities becomes actualized by a macro matter-energy interaction the superposed quantum waves undergo a change that conveys the information. This change might take multiple forms including the collapse of all other wave functions aside from the one actualized, or collapse of that particular wave function, or some distinction of the actualized one with no collapse, or all funneling into one actualized state.

Embodied in the information regarding the actualized potentiality is the applied low entropy based on information itself representing a low entropy state. An analogous process occurs with various media where the low entropy applied in producing the written word, song over the radio, television signal, email etc. is embodied in the information content of the media source. The actualization of potentialities and applied low entropy process entails “Bit from it” with the transfer of information from the macro matter-energy world to the quantum world. Within the configuration space the actualized potentiality is registered and recorded providing an actualization record that probably persists for the life of the universe, and likely beyond in what might be conceived of as a quantum nugget. Every action each of us has done and will ever do is likely recorded forever! Information capacity of this magnitude is virtually inconceivable in our macro matter-energy universe but is very much within the capacity of the quantum world. Record formation is a characteristic of the quantum world, and according to the unitary principle all information must indeed be conserved within this world.

So far the story has involved the quantum and macro matter-energy worlds. Quantum potentialities and probabilities provide options in the macro matter-energy world, and actualized potentialities are recorded in the quantum world. What about space-time as a major player? The proposed role of space-time obviously represents conjecture much as with string theory, but is based on a universe viewed from the perspective of biological life. If we assume that space-time is an entity and one that can change size, shape and the number of dimensions consistent with relativity theory, it is feasible that it represents much more than is commonly assumed—It might well represent a dynamic entity with an existence that extends beyond our universe, but at the same time relies on the existence of our universe and perhaps that of others.

The universe seems to be very finely tuned to allow for a very gradual progression from low to high entropy. A very minor change in some of the parameters of the universe such as dark energy would lead to either collapse of matter-energy into an infinitely dense object due to the unopposed effect of gravity, or of all matter-energy diluting to nothingness. While it has been proposed that there might be multiple universes or the quantum equivalent and only a unique one with these values persisted, it is perhaps more feasible that there is an unexplained symmetry to the process favoring certain potential universes. It is posited that space-time plays an active role in this symmetry by entering a quantum nugget possessing certain qualities and providing true existence. In discussions of physics and astronomy existence is rarely considered despite the continual creation and annihilation of particles at the quantum level. In biological systems existence, persistence, and the demise of life forms is an obvious reality.

Space-time provides existence to matter-energy once the quantum nugget is entered, and the onset of existence likely drives the incredible inflation of the universe that occurs within the first microseconds of the Big Bang. With inflation the universe

expands from a micro quantum level to a macro level, It from bit. This process might arise from the acquisition of properties inherent to matter-energy and expressed once existence occurs. Space-time in essence provides for the true existence of matter-energy. With the onset of existence the universe is in a state of lowest entropy and highest potential. For the progressive actualizations of potentialities and application of low entropy to transpire both space and time are required—Space for matter-energy entities to interact and a temporal dimension to allow for a the transition from low to high entropy. Adopting this required form is consistent with the notion of space-time being flexible in size, shape and even the number of dimensions. In another type of universe where the requirements for actualizing potentialities and applying low entropy are different, such as additional dimensions, “space-time” can assume the needed form.

In line with the natural concept of symbiosis we might ask what space-time gets from the experience? It is posited that space-time acquires high quality energy provided by low entropy. In a somewhat analogous fashion we benefit from the low entropy embodied in the information content of media sources. The quantum world acts as the interface between space-time and the macro matter-energy worlds, transferring the low entropy embodied in the information content of the actualized potentialities. The universe is well set up to parse out low entropy gradually. If the progression from low to high entropy was all that counted there is no reason why the conversion could not occur all at once. Space-time appears to require that the high quality energy transferred in the information content of the quantum world be parsed out in an ongoing fashion. If we conceive of space-time as a dynamic entity with its own existence, then much like a biological organism requiring ongoing sustenance, space-time might require a continual influx of high quality energy.

Biological life is rarely considered to be of any value to the universe in physics and astronomy theories. However, in the model posited here it has an important role—Based on actions biological life has an enormous capacity to actualize potentialities and apply low entropy making it an entropy facilitator. For example, plant life engages in photosynthesis, absorption of nutrients, and conversion of them into leaves, flowers, and other structures. Animal life with the freedom to move about has the capacity to actualize even more potentialities. Intelligent life represents the apex of the capacity to actualize potentialities and parse out low entropy in the information content. The brain is the ultimate entropy facilitator when considered on the basis of quanta of applied low entropy or actualizations of potentialities per unit of matter-energy. The enormous information processing capacity and generation of thoughts, emotions, desires, impulses, and reactions represents incredible activity in terms of actualizing potentialities. Every mental activity in itself represents a potentiality actualized and every physical action following from this mental activity actualizes many more potentialities. Extensive sequences of low entropy are routinely applied, such as in solving a problem with mental energy derived from nutrients consumed and using energy and other resources to enact the solution.

The advanced entropy facilitation role of more complex organisms might augment the influence of natural selection in the progression of biological organization over time. More complex forms of biological organization, and certainly as pertains to increasing cognitive capacity, provide an advantage in the competition that is at the heart of natural selection, and also maximize the quanta of low entropy applied. A universe where advanced biological life is able to arise and facilitate greater parsing out of low entropy might be selected for so to speak by space-time, based on qualities recorded in perpetuity by the quantum nugget. It is conceivable that once the low entropy of the universe is expended, space-time withdraws and macro matter-energy loses existence. The quantum nugget persists with its actualization record, and if in possession of the right properties can be re-entered by space-time.

A quantum nugget suggesting undesirable properties such as no range of entropy will not be selected for. Interesting, with cyclical models entropy increases each cycle, an occurrence that is typically viewed as a problem with such models. If the range of entropy from low to high increases, this process would lead to that universe being favored by space-time as there will be more low entropy to parse out. In a sense then there is a natural selection process occurring with space-time and different universes, and the capacity for life would represent an important selection criteria. Furthermore, a universe capable of evolving active and intelligent beings capable of actualizing enormous potentialities per unit matter-energy would be even more favored. Contrast this with a universe offering conditions incompatible with life and a small range of entropy. The crucial biological process of natural selection then might have an equivalent at the space-time level!

CONVERGENT POINTS:

Arrows of Time: A direction of time is not necessarily predicted by physics and yet there does seem to be a set direction of time in the form of thermodynamic, cosmological, radiative, quantum, and psychological arrows of time. So far these arrows of time are largely inexplicable and resist attempts at synthesis. Approaching time as the progressive actualizations of potentialities involving the application of low entropy, affords a straightforward and parsimonious method of aligning them. The thermodynamic arrow of time concerns the natural increase in entropy. Viewing it as a progression from high potentiality/low actualizations to low potentiality/high actualizations required by the symbiotic model outlined provides a coherent framework. Low entropy is parsed out in a sense by this process. In regards to the cosmological arrow of time the overall purpose is for the universe to apply low entropy via the actualization of potentialities, and hence it will naturally progress from low to high entropy. At the start of the universe general and gravitational entropy are lowest and potentialities highest. As the universe progresses potentialities are converted to actualizations and entropy increases. One way of looking at this process is in terms of the ratio of free low entropy that can be applied to total

entropy. At the Big Bang the ratio is one, and as free low entropy is applied the ratio declines reflecting how the low entropy remaining to be applied in actualizing potentialities diminishes relative to the total entropy of the universe.

The radiative arrow of time involves effects proceeding in one direction such as a rock thrown into a pond and the waves spreading out, or light waves extending out from a flashlight. Even though equations allow for the reverse in practice these are never seen, at least in the macro matter-energy world. If we think in terms of the forces of the universe facilitating actualizations of potentialities, it follows that there will always be a progression from potential to actual and the related application of low entropy. In the examples provided the potentialities actualized follow a natural sequence from rock thrown and light emitted from flashlight to waves reaching the shore and light beam striking a target, respectively. The entire progressive actualization of potentiality process is meaningless if we go from the actual to potential. In the quantum world all potentialities including reversed arrows of time exist as superposed waves varying in probability, with the probability values so low for these occurrences that they never manifest at the macro matter-energy level.

The quantum arrow of time refers to superposed wave states seemingly collapsing into one state when an interaction occurs. The quantum world allows for all potentialities providing the macro matter-energy world with potentialities equivalent to low entropy. These potentialities will vary in probability consistent with the probability aspect of quantum waves and the actualization sequence that has transpired. For example, typing on the keyboard the next most probable potentiality to be actualized is another letter typed. Less probable but possible is that I will take my hands away to rub my eyes. Infinitely less probable but potential is that I will stand up and flip over backwards. With the next letter typed the range of potentialities collapse into the one actualized state. In the macro matter-energy world quantum probability plays a crucial role and sequences of actualized potentialities typically follow the most probable course. The quantum world records these actualized potentialities as collapse of the relevant superposed waves into one actualized state. This state comprises a record of the actualized potentiality. Hence, there will always be a collapse of many superposed wave states into one with the actualization of potentialities process.

The psychological arrow of time is provided by the universal belief that the past is completed and only memories, the future not set, and the present or now involving the conversion of options into realities. For many people this is described as the flow of time but there is no such thing as time actually moving, and the speed of passage varies with the observer as predicted by relativity theory. Time can be more accurately conceptualized as the progressive actualization of potentialities consistent with the notion of time as change. The future represents potentialities varying in probability, the past consists of actualized potentialities, and the now the conversion of immediate future potentialities into actualizations. The now has been likened to a saddle with the front part

vanishing potentialities and the back increasing actualizations. In one sense this process might seem like a flow but the only thing changing is the actualizations of potentialities and application of low entropy. The role of the brain as the ultimate entropy facilitator actualizing countless potentialities reinforces the psychological arrow of time given that the entire process is playing out within us. The process of potentialities being actualized by matter-energy interactions and consequent application of low entropy links all the arrows of time to one another, and provides a symmetry to the universe that supports natural conservation laws.

Time Travel: Time travel is possible in the quantum world based on the sameness of fundamental particles, meaning that they must play the same role in every circumstance. Another way of looking at the matter is that there is no range of potentiality in the form. Consequently, a particle going back a thousand years will have no new impact on any actualized potentiality occurring then and so cannot alter the actualization record. Macro matter-energy entities due to their uniqueness will alter the actualized event if they were to go back in time. The past consists of actualized potentialities with no change possible. It simply is. One option consists of a time traveler being part of a past actualized potentiality, an impossible occurrence given that this person was not yet born and the time machine had not been invented. Perhaps a creature from a different region of the universe goes back in time. The same problem applies because if the creature is truly going back in time the past cannot be changed. It would have to have already been part of the actualized potentiality, again impossible because it was not born and its time machine likely not invented. It is possible that a creature could visit our past while it represented a now to that creature, but the presence of the creature would be involved in the actualized potentiality and show up in the record. Of interest, we talk about time travel but miss what is viable at some point—To learn how to decipher the quantum actualization record that will record every last detail of every event! It would be the perfect history book detailing every event without biased interpretation.

Future time travel likewise is not truly possible although something mimicking it can occur. The future is only potentialities varying in probability offered by the quantum world. The further ahead we go the less probable given that many events can intercede and influence the outcome. Just as traveling backwards in time is not possible because actualizations cannot be altered, forward time travel is not viable because it would actualize potentialities out of sequence—A future potentiality would be actualized while potentialities prior to it remain as only potentialities. The future potentiality actualized by forward time travel would become part of the now and rapidly the past, while leaving potentialities leading to it unaffected. Given that these potentialities link to the one actualized they might collapse into an actualized state as well. In effect it would eliminate part of the future and perhaps all of it. Picture all superposed quantum waves representing every potential future event collapsing. The future is potentialities and must remain as such.

A form of future time travel is known as time dilation, a relativity phenomenon whereby accelerating close to the speed of light in terms of passage through space slows one's passage through time. You leave the planet and accelerate to near the speed of light. Forgetting for the moment that no biological creature could survive the acceleration, you spend several hours on your high-speed journey and then decelerate and return to Earth. You discover that everything and everyone you know are long gone, because the near speed of light passage through space has slowed your passage through time to almost zero. Meanwhile, everything and everyone you knew aged millions of years and hence are gone.

While time dilation might seem like time travel it is not true time travel. First, no degree of time dilation will ever return a person to prior to the time left. Second, you never travel to your own personal future and see yourself at a later age. With time dilation you are only a few hours older. Third, you have to physically separate and later return to Earth. If you simply speeded up the planet everything and everyone on it would age only a few hours in synch with one another. You would not notice anything different, although a look into the heavens might reveal new constellations and stars. The time dilation form of "time travel" is possible because you are not changing the nature of future potentialities. The future potentialities of the planet become actualities without your presence and once you slow to the speed of the planet you join and participate in the progressive actualizations of potentialities. Tremendous variance in relativity phenomena, such as speed of passage through space and time, between yourself and the planet you left occur, because by leaving Earth and speeding up you became completely uncorrelated with everything on the planet. Upon returning you become correlated to the planet and there is no significant variation in relativity phenomena between yourself and the planet.

Another possible option for time travel is based on the multiverse view whereby there are parallel universes each with a different version of every entity. This means that there are universes with countless versions of myself, one for each universe. There are several problems with this concept generally and also in relation to time travel. First, it mistakenly attempts to provide the macro matter-energy world with quantum characteristics, namely the presence of all versions or states of an entity at the same time. In the quantum world all potentialities exist as superposed waves only varying in probability. The quantum world provides these potentialities varying in probability to the macro matter-energy world, but in the latter only one actualized version ever exists. Even in the quantum world the actualized potentiality is distinct and alone carries the low entropy embodied in the information content. Second, all versions of a given entity are highly correlated, and as such must remain in physical proximity in the macro matter-energy realm, and not in different universes.

The third major problem concerns time travel. Even assuming that multiverses could all be physically connected in line with the high correlation of the given entity,

severe problems involving impossible actualization sequences arise as with time travel proposed within one universe. For example, the version of me at 40 actualizes a potentiality that must impact on all versions given their high correlation. The 2-year old version experiences this actualized potentiality when the 3 to 40 year old potentialities lie in the future. The 70-year old version has already actualized 40-year old potentialities that cannot be changed. Furthermore, any change however slight in the actualization sequence throws everything off. For example, given that the future is only potentialities varying in probability it is feasible that the 2-year old version of me will experience a unique low probability potentiality that the other versions did not. If this occurs all the latter versions must absorb this new actualized potentiality but my 2-year old potentialities have already been actualized. Any conjecture that the different versions of me are uncorrelated is ludicrous because if they are me they are correlated. For these reasons adding the option of a multiverse does nothing to help further the cause for true time travel.

Boundaries Supporting the Actualization of Potentiality Process: The speed of light so relevant to the time dilation effect provides a crucial boundary to the whole process. No body with mass, or any macro matter-energy entity can achieve the speed of light in regards to passage through space. If it did then there would be no room for passage through time and the progressive actualization of potentialities would cease. The speed of light limitation for macro matter-energy entities ensures that the process continues, although the rate can vary consistent with relativity theory. The speed of light limit also prevents impossible scenarios such as a creature from another part of the universe jumping from his now to my future before my future has occurred. With instant or vastly faster than the speed of light travel over great distances of space such a scenario could occur, but could not given that my future is only potentialities. How can it be visited before the sequence of actualizations to it is completed? Also, if the being did visit it future potentialities would undergo actualization out of sequence raising the problems encounter with true future time travel. The speed of light limitation ensures that the being cannot arrive at my future before I actualize the sequence of potentialities leading to it. Another boundary on the actualization of potentiality process is the third law of thermodynamics indicating that absolute zero temperature can never be achieved. At absolute zero all interaction of matter-energy entities cease, and there is no further actualizations of potentialities.

Dark Energy (Repulsive Gravity): Normal gravity attracts and distorts the fabric of space-time itself. Dark energy also involves the fabric of space-time stretching and expanding it. This mysterious force is believed to comprise about 70% of the universe. It is very finely tuned to support the universe as we know it, with a fractional deviation in either direction leading to either the clumping of matter-energy under the influence of gravity or rapid dilution of matter-energy to nothingness. Within the context of the symbiotic model of the universe proposed here, dark energy serves a few crucial functions. First, dark energy prevents macro matter-energy from clumping, thereby

allowing matter-energy interactions and actualizations of potentialities to continue. Second, it preserves the synchronization of gravitational and general entropy—If gravity is unopposed the clumping of all matter-energy would mean that gravitational entropy proceeds quickly from low to high, given that maximal clumping represents a state of high entropy in so far as gravity is concerned. Meanwhile, the more general entropy that gravity contributes to and constitutes a part of would proceed from low at the Big Bang to higher and back to low, given that maximal clumping represents a return to the incredibly dense matter-energy found at the start of the universe. In essence gravitational and more general entropy would no longer align producing a lack of symmetry. Third, by gradually diluting the universe to nothingness dark energy ensures that the universe will progress to highest entropy.

Gravity: Gravity is normally conceived of as warping space-time based on the influence of matter-energy. In the model proposed here the quantum world is seen as the interface between space-time and the macro matter-energy worlds. In a symbiotic fashion space-time provides existence to the macro matter-energy world via the quantum world, and the latter in a sense feeds space-time high quality energy (low entropy) embodied in quantum information regarding actualization of potentialities occurring in the macro matter-energy world. Space-time and the macro matter-energy worlds might be fundamentally incompatible preventing direct contact, hence requiring the quantum world as an interface. Gravity itself could arise from the incompatibility of space-time and the macro matter-energy worlds. In effect the latter displaces space-time. In the case of stationary objects, at least relative to one another, this produces a warping of space-time. The displacement is more of a thinning displacement as space-time is ubiquitous, creating something of a valley in space-time that macro matter-energy entities slide along to interact.

In the case of moving objects of sufficient mass, corresponding motion occurs in the fabric of space-time due to the displacement. For example, rotating bodies will drag space-time by a whirlpool effect much like a boat that is spun around and around rapidly does with water. Likewise, motion to and fro like with a boat sets up ripples in the fabric of space-time. Gravity derived from the inability of space-time and macro matter-energy to interface directly, resulting in a displacement of the former by the latter fits with this observation. Gravity would not then be expected to be part of what might be referred to as the space-time realm that is hypothesized to exist beyond any given universe selected for by space-time. By serving as the interface between space-time and the macro matter-energy worlds the quantum world conveys gravitational entropy. Given that gravitational entropy facilitates actualizations of potentialities recorded in the quantum world, gravity might be quantized in the form of units of applied low entropy and/or actualized potentialities derived from the effect of gravity.

Spiritual Aspects: Although not conceived as such certain aspects of the model suggest a possible spiritual component. Space-time is seen as an entity in and of itself that can vary

in terms of shape, size, and even number of dimensions. It is believed to exist beyond the universe in what might be considered a space-time realm, and provides existence to macro matter-energy by entering a quantum matter-energy nugget. These features of space-time are consistent with more aboriginal type beliefs of a force of nature ever present although not necessarily directly influencing things. Based on the model proposed there is no reason to assume that space-time possesses intelligence, at least as we know it. However, based on the natural selection component of the theory, space-time selects quantum matter-energy nuggets with desirable qualities recorded in the actualization record, such as an extensive range of entropy and the possibility of biological life due to its entropy facilitating nature. This opens the door somewhat to the possibility of a more intelligent entity linked to space-time, perhaps even requiring the high quality energy (low entropy) acquired by space-time. This entity might play a role in the selection process, but as with many other parts of the theory this remains highly speculative.

CONCLUSION:

Applying a biological perspective to the universe represents a novel approach and one that respects the significance of concepts such as interconnectedness and symbiosis. It affords the potential of unifying entities and processes that otherwise remain dissociated from one another. Of course a model of this nature will be highly speculative but no more so than string theory, arguably the dominant theory of the universe currently and one that even proponents of it suggest might never be testable. Biological systems are part of the universe and in all likelihood derived from the same basic templates as other structures. We can then gain some insight into the universe from our knowledge of how biological systems operate, and in nature interconnectedness and even symbiosis are dominant themes. No biological entity exists in isolation from other such entities and the physical environment, and there is reliance on one another that takes some fascinating forms.

From the perspective of biological systems it is reasonable to view the major players in the universe including space-time, the quantum world, and macro matter-energy world, as being very interconnected. Due to its many unique properties the quantum world is ideally qualified to serve as an interface between space-time and the macro matter-energy world. In a process akin to natural selection space-time provides existence to matter-energy by entering a quantum matter-energy nugget with desirable traits and driving inflation. Consistent with its interface role the quantum world provides the macro matter-energy world with potentialities only varying in probability derived from superposed waves. Interactions within the macro matter-energy world actualize certain potentialities and in the process low entropy is applied. Within the quantum world this actualized potentiality is recorded based on a process related to collapse of the wave function. The virtually infinite information capacity of the quantum world enables every potentiality ever actualized to be recorded permanently forming an actualization

record. The highly ordered state inherent in the nature of this information embodies the low entropy that has been applied in the potentiality actualized. The quantum world conveys this low entropy to space-time. In a truly symbiotic fashion the macro matter-energy world has then reciprocated by providing space-time with high quality energy in the form of applied low entropy.

The symbiotic model described relies on key processes in the universe including entropy, information, gravity and the other three forces, that largely remain poorly synthesized in other approaches. Entropy and information are linked in that the actualization of potentialities process applies low entropy, and the quantum-based information regarding the actualized potentiality embodies the low entropy. Gravity is viewed here as a displacement of space-time by macro matter energy, that contributes a significant component to the general entropy of the universe in the form of gravitational entropy. The other three forces also play a major role in general entropy by promoting interactions within the macro matter-energy world. Dark energy ensures that the universe does not proceed from low to high gravitational entropy too quickly due to unopposed positive gravity.

The common function of gravity and the other three forces offers a potential method of quantizing gravity by quantizing the application of low entropy and/or actualization of potentialities process derived from all four forces. Viewing time as the progressive actualization of potentialities provides a straightforward synthesis of currently disconnected arrows of time. The symbiotic model proposed also brings clarity to the frequently confusing picture surrounding time travel options. While speculative a biologically based perspective of the universe does offer insights into the interconnected nature of the universe. It also elevates biological processes to the level deserved in terms of the knowledge to be derived regarding functioning of the universe, the potential role of “natural selection” in determining if a universe acquires existence from space-time, and the prominent role of biological entities as entropy facilitators.

References

- Atkins, P. (2007). *Four Laws That Drive The Universe*. Oxford, England; Oxford University Press.
- Barbour, J. (1999). *The End Of Time: The Next Revolution In Physics*. New York, New York; Oxford University Press.
- Barrow, J.D. (2007). *New Theories Of Everything*. Oxford, England; Oxford University Press.
- Deutsch, D. (1998). *The Fabric Of Reality*. London, England; Penguin Books.
- Falk, D. (2008). *In Search Of Time*. Toronto, Ontario; McClelland & Stewart Ltd.
- Ford, K.W. (2004). *The Quantum World—Quantum Physics For Everyone*. Cambridge, Massachusetts; Harvard University Press.
- Greene, B. (2004). *The Fabric Of The Cosmos*. New York, New York; Vintage Books.
- Hammond, R. (2008). *The Unknown Universe: The Origin Of The Universe, Quantum Gravity, Wormholes, And Other Things Science Still Can't Explain*. Franklin Lakes, N.J.; The Career Press Inc.
- Hawking, S., Mlodinow, L. (2005). *A Briefer History Of Time*. New York, New York; Bantam Dell.
- Kaku, M. (200). *Physics Of The Impossible: A Scientific Exploration Into The World Of Phasers, Force Fields, Teleportation, And Time Travel*. New York, New York; The Doubleday Broadway Publishing Group.
- Lockwood, M. (2007). *The Labyrinth Of Time: Introducing The Universe*. New York, New York; Oxford University Press.
- Moffat, J.W. (2008). *Reinventing Gravity: A Physicist Goes Beyond Einstein*. Toronto, Ontario; Thomas Allen Publishers.
- Musser, G. (2009). Easy go, easy come: What spoils quantum entanglement can also restore it. *Scientific American*, November, 25-26.