A Proposed Unified Theory of Human Nature

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This text is the abstract of a book, which is in preparation for publication. Evidence for various proposals about human nature is contained in the book.

Albert Einstein (1879-1955) and Sir Arthur Eddington (1882-1944) believed that the laws of thermodynamics were the laws of physics least likely to be falsified.

> *A theory is the more impressive the greater the simplicity of its premises is, the more different kinds of things it relates, and the more extended is its area of applicability. Therefore the deep impression which classical thermodynamics made upon me. It is the only physical theory of universal content concerning which I am convinced that, within the framework of the applicability of its basic concepts, it will never be overthrown (for the special attention of those who are skeptics on principle).*
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> *Albert Einstein "Autobiographical Notes" (1949) [1]*

> *The law that entropy always increases - the second law of thermodynamics - holds, I think, the supreme position among the laws of Nature. If someone points out to you that your pet theory of the universe is in disagreement with Maxwell's equations - then so much the worse for Maxwell's equations. If it is found to be contradicted by observation - well, these experimentalists do bungle things sometimes. But if your theory is found to be against the second law of thermodynamics, I can give you no hope; there is nothing for it but to collapse in deepest humiliation.*
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> *Sir Arthur Stanley Eddington*
> *Gifford Lectures delivered at the University of Edinburgh (1927)*
> *Lecture IV "The Running-Down of the Universe" [2]*

We begin our reasoning about human nature with the laws of thermodynamics. As material members of our universe, human beings are constrained, if not necessarily explained, by the (current) laws of physics.

The first law of thermodynamics, the law of the conservation of energy, indicates that there is a finite amount of energy in our Universe. In his Special Theory of Relativity, Albert Einstein equated matter with energy, thus conserving matter in line with the first law.

We propose a corollary to the first law of thermodynamics: In a Universe of finite energy and matter, some things necessarily exist to the exclusion of other things. Therefore, competition for existence is a core principle of our Universe.

The second law of thermodynamics, the law of continually increasing entropy, ensures that no structure is permanent. The law of entropy continually stirs our finite pot, thus ensuring that the competition for existence is dynamic. The chemist Peter Atkins argues in his book, *Four Laws Which Drive the Universe* (2007), that this is indeed what happens. [3]

Biochemists, following Josiah Willard Gibbs (1839-1903), recognize that living structures must continually expend energy in order to maintain their structure in the face of the second law. In order to expend energy, living structures must consume energy and other material structures external to themselves. This necessity to consume other structures, in order to survive, exacerbates the core competitive-survival principle in our Universe. All living structures are thermodynamic systems. (See *Biochemistry Third Edition* (2000) by Christopher K. Mathews, K.E. Van Holde and Kevin G. Ahern) [4]

This leads us to the biologist, Charles Darwin (1809-1882). There are three parts to Darwin's theory as outlined in: *The Origin of Species by Means of Natural Selection* (1859), *The Descent of Man and Selection in Relation to Sex* (1871), and *The Expression of the Emotions in Man and Animals* (1872). The first is his theory of evolution. The second is his theory of natural selection. The third is his evidence of innate competitiveness, which we consider to be the most important part of his work, certainly the most neglected part. Darwin also incorporates the economist and demographer, Thomas Malthus (1766-1834), who, in his *Essay on Population (1798)*, observed that the multiplicative reproductive rates of living structures exacerbates the competitive survival principle. [5]

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A second pillar in our reasoning about human nature is less well acknowledged than the laws of thermodynamics. This pillar is the principle of emergence. Emergence, for our purposes, is defined as the appearance of new and unpredictable properties at each new level of structural complexity. The Periodic Table of the elements is, among other things, a Table of emergent properties. For all we know, our Universe, with its finite amount of matter and energy, is emergent.

Science is based upon predictability. Once properties 'emerge', their behavior can be analyzed by science and can become predictable, either deterministically or probabilistically. Their initial appearance is not predictable, however, and that is what we mean by 'emergence'. In our universe, there are levels of increasing structural complexity. What are wholes on one level, become parts on the next level. Lower level laws constrain, but do not necessarily explain, higher level functioning. Until science can explain origins, a thoroughgoing philosophical reductionist position is intellectually untenable. This is not to say that science should not try to explain origins, nor to assert that science will not succeed. It is a prediction that the task will be difficult, and, since lives are short, people may choose other explanations. In the book, we discuss the philosophical history of the concepts of emergence, hierarchies, and parts and wholes.

Living structures have many emergent properties that they share. A critical emergent property is the ability to respond to stimuli. We define this ability as 'awareness', and suggest that it is the core principle of consciousness.

Emergent properties of living structures include: the ability to respond to stimuli; the ability to orient and to move purposefully (the purpose being survival); *the ability to collect, store, organize, retrieve, and communicate information about the environment; the ability to constantly renew, that is, to fabricate, a highly ordered structure and the ability to self-replicate. All of these emergent properties are dependent upon the emergent property of consumption, and the ability to thermodynamically convert the matter and energy consumed, into the energy necessary to carry out these emergent functions*.

We propose that emergence is a continuing phenomenon; that our Universe, and the living structures within it, will continue to emerge in surprising ways, but that as long as the laws of thermodynamics hold, the core principle of competition will hold as well.

We will suggest, that this emergence, which includes the evolution of living structures, is not totally random, but that it occurs within certain parameters. We find evidence for this in quantum mechanics, in the parallel behaviors that occur across levels of structural complexity, and in the survival strategy behaviors that appear in otherwise widely separated living species. We follow Werner Heisenberg's (1901-1976) advice to physicists studying quantum mechanics, and we look at the behavior. Observing behavior also happens to be the primary scientific approach utilized by ethologists - those who study animal behavior. We note, for example, that electrons, like all fermions, follow Wolfgang Pauli's (1900-1958) exclusion principle, and keep a distance from their 'con-specifics'. This behavior in animals is referred to as 'territoriality'. Photons, on the other hand, like all bosons, clump together with their 'con-specifics', which in animals is referred to as 'social' behavior.

Francis Crick (1916-2004), one of the principle discoverers of DNA, defines 'emergence' in his book, The Astonishing Hypothesis, as follows: *"A system has emergent properties if they are not possessed by its parts. In science, "emergent" does not have mystical overtones."* We can explain how things work, but we cannot yet explain how things came to be. Evolution and natural selection explain how things work, but they merely push back in time the question of how things came to be. Darwin's proposal of the nutrient rich 'soup', the presence of organic compounds, and maybe a little electricity, as an explanation, is not very edifying. Even if it can be established that such conditions do indeed create life, how to explain the incredible emergent properties which living things exhibit? Science has a way to go. This issue is discussed more fully in the book. [6]

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The anthropic principle in physics proposes that the Universe, in particular our Earth and Solar System, are the way they are in order to support life. We turn that principle around a little, and say that life is as it is in order to survive in the Universe as it is. The range of environmental conditions within which life can be supported is very narrow, and survival is not a cakewalk. We argue that to understand human nature, we have to understand how much of human behavior is driven by the survival requirements of this Universe. We term those survival requirements 'needs'. Needs are dictated by the 'evolutionarily' derived information recorded upon our DNA. The message is: "Meet these needs or die." However, because the Universe is in a state of flux (due to the second law of thermodynamics), our evolutionary DNA has acquired the information that the environment is not always the same. Needs can therefore be met within a range of possibilities, and the genes may even adapt to differing circumstances. This is the essence of the nature/nurture debate. Our position on this debate is that the survival needs are fixed within our DNA, but some flexibility in how those needs are met is possible. Secondly, that needs have developmental experiential requirements, which must be met, for the successful maturation of the individual organism. It also means that, if we hope to solve human problems, we have to have a clear understanding of what those survival needs are, in order to understand how they affect our survival and our behavior.

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We have developed a classification system for the survival needs of living structures, including humans. Each class of needs has specific characteristics, awareness of which may help researchers to sort things out. There are two sets of need classes. The first set includes those classes of needs that are essential to individual survival. It means: these needs are met, or the individual dies or is severely damaged. The need for food and oxygen are classic examples of this class of needs. The second set of need classes includes those needs that are essential to the survival of the species, but are not essential to the survival of the individual. This is an important distinction. The individual can survive without meeting these needs, but the species will not. In consequence, evolution has established, through natural selection, these species survival needs with strong internal drives, which are necessary to encourage individuals to engage in these behaviors, which tend to put them, as individuals, at risk. Sexual reproduction is the classic example of this class of needs.

The biologist Richard Dawkins does not believe that species survival requirements play any causative role in behavior. He and the ethologist Konrad Lorenz (1903-1989) disagreed on this point. Dawkins believes that the individual gene's drive to maintain and reproduce itself, drives all behavior. We discuss this, in the book, and point out that the individual genes cannot survive outside of a system. In addition, postulating the existence of species survival needs, increases explanatory power. [7, 8]

The need classes exhibit time parameters in their expression and they exhibit interference patterns. Interference patterns are also seen, for example; in quantum particles, including Pauli's exclusion principle for electrons, and the wave interference patterns of light; in the dominant and recessive expression of competing genes; in the excitatory and inhibitory characteristics of neurons; in the dominance of certain survival need classes, as we propose; and in the dominance and territorial behavior of members of living species.

In 1954, the psychologist, Abraham Maslow, (1908-1970) published *Motivation and Personality*, which contains a proposed needs classification hierarchy. Maslow specifically rejected competition. According to his system, the 'upper' level needs, in his hierarchy, were only addressed after 'lower' level needs were met. In our proposed classification system, the relationship between the need classes can be competitive, and the individual organism can experience need conflict - something which we think that we have all experienced. Evolution has developed a 'rough' system for dealing with need conflict, which leads to probabilistic outcomes. Maslow's 'highest' need is the need to self-actualize. We strongly endorse this need as the representation of the principle of Emergence. Maslow is discussed at length in the book. [9]

In the 1920's, the physiologist Ivan Pavlov (1849 - 1936) published *Conditioned Reflexes* and *Conditioned Reflexes and Psychiatry.* Pavlov described needs as 'instincts', and identified most of the same 'needs' as are included in Maslow's hierarchy and in our classification system. Pavlov pointed out that much work needed to be done to fully understand our survival 'instincts'. Pavlov's work on conditioned reflexes plays an important role in our theory about developmental needs. We argue that much of the behavior that is considered 'genetic' results from environmental experiences, or lack thereof, during the developmental period. Pavlov's work on the role of the conditioned reflex in emotional development was ultimately rejected, although much work was subsequently done, primarily by experimental psychologists working with animals, and by learning theorists.

We wish to reintroduce the relevance of Pavlov's work. As we observe, a dog that salivates at the sound of a bell may be an animal model for the inappropriate affect that is so characteristic of mental illness. In the developmental process of the child, what becomes associated with pleasure and what becomes associated with pain? This becomes especially significant with needs subject to 'one trial learning'; that is, one experience that produces a conditioned response to a stimulus associated with pain and fear. One-trial learning has been repeatedly demonstrated in experiments. In fact, it is so reliable, that the fear response is now used experimentally to test for other behaviors, reactions, and attributes. The phobic fear response has been accepted as legitimate, but phobic conditioning occurs, developmentally, after the child is able to discriminate. What if the response is conditioned before the child is able to discriminate? Do we then get generalized anxiety? Pavlov is discussed at length in the book. [10, 11]

Gerald M. Edelman, who won a Nobel prize for his work on the physiology of immunology, has turned his attention to neuroscience. He has developed a *Theory of Neuronal Group Selection*. This theory proposes that, in the development of the brain and consciousness, environmental experience 'selects', in the Darwinian sense, from previously selected and established 'neuronal groups'. He terms these groups 'value centers', and they reflect survival requirements. These 'value centers' correspond to our concept of 'survival needs'. Edelman has not, as yet, to our knowledge, proposed specific 'value centers'. We had originally proposed that the 'survival needs/value centers' are located in the limbic system, that portion of the brain between the cortex and the brain stem. The 'limbic system' is a term coined by the neuroscientist Paul D. MacLean, who developed a theory called, *The Triune Brain (1973)*. Edelman, and co-author, Giulio Tononi, in their book, *A Universe of Consciousness (2000)*, have identified a topological region of the brain that they refer to as the 'noradrenegic locus coeruleus' that covers roughly the same area as the Limbic System. Edelmann and Tononi provide considerable evidence concerning brain development, which supports our concept of developmental needs. They have neurologically operationalized Pavlov, by demonstrating that, with respect to neurons, those which fire together, wire together, even over relatively great distances. Francis Crick objected to Edelman's theory. In the book, we discuss the controversy and the findings of neuroscience. [12-14]

Evolution has created a developmental period in species in which environmental conditions can dictate how the organism continues to develop based upon environmental input. Jean Piaget (1896-1980), who taught us much about how humans develop intellectually, especially how children learn logic and mathematical concepts, also spent his life studying the evolution of snails and ferns. He discovered that the phenotypic expression of the genes for certain traits in these species varied depending upon the environment in which the young snail or fern was located. The traits were: the shell of the snail, and the leaves of the fern. His research was ignored, and he had to defend himself against charges of LaMarkianism, but that is another story. His approach is now ensconced in the new field of Epigenetics. Dependence upon environmental experience opens up the possibility of an error rate (the wrong message is received), but its survival value for the individual species is so great that a significant error rate is tolerated, without diminishing the success of the species. (Edelman points out that variation is necessary for natural selection to act upon, and does not necessarily imply an error rate. However, errors do occur in reproduction and maturation, and it is recognized that most mutations are harmful.) Piaget is discussed in the book. [15, 16]

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A Proposed Needs Classification System

The specific needs in each of the following need classes will vary by species. Evidence concerning the various need classes will be presented in the book.

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Individual Survival Need Classes:

The needs represented by these need classes are essential to the survival and/or successful maturation of individual members of each species. These needs are served by sensory apparatus that provide immediate environmental information critical to survival, as well as by, selected genetic behavioral responses.

The Safety Need Class

The safety needs are constant and life long. The safety needs have a strong genetic reflex component and are subject to what the learning theorists refer to as 'one-trial learning'. The safety needs, in humans and other vertebrate species, are sited in the Limbic System, specifically in the amygdala, which demonstrates their early evolutionary development. The safety needs are largely served by the emotions of fear and anger. The safety needs have the capacity to dominate needs, in the other Individual Survival Need Classes, when there is a need conflict. While, as we shall see, the needs in the Species Survival Need Classes, all have strong internal drives developed to overcome the safety needs; in extreme situations, the safety needs still dominate. This is always subject to a probability statement. We have always referred to the conflict, between the safety needs and the self-maintenance needs, as the 'tiger at the water hole'. In, *The Tarner Lectures*, *Mind and Matter*, delivered at Trinity College, Cambridge, October 1956, Erwin Schrödinger (1887-1961) refered to the safety needs as 'foes' and used the analogy of the 'lion at the water hole.'. [17]

The Self-Maintenance Need Class

The self-maintenance needs are also life long, but they are periodic rather than constant. They oversee the thermodynamic processes of living structures, and so they, also, evolved at the beginning of life. They have adapted to exploit the various opportunistic environments. The plants evolved first, utilizing the energy of the sun. The plants created oxygen in the atmosphere, and they created carbohydrates and sugar in their structures. The herbivores consumed the plants and the oxygen and created carbon dioxide in the environment (which was utilized by the plants) and protein in their structures. The predators then appeared, including humans, and consumed the protein and the oxygen. This entire thermodynamic process, and chain, is profound and essential. Both space and time are essential to the functioning of this process: space in the form of the cold sink, and time, as ensuring a sequence of events. Rest, as a part of the thermodynamic process, is also a self-maintenance survival need. This system of self-maintenance needs will significantly 'shut down', when the safety needs are aroused, and the individual organism goes into the 'fight or flight' mode. The self-maintenance needs are largely served by appetitive behavior and are also located in the Limbic System.

The Developmental Needs

The developmental needs, rather than being life-long, are time limited. As discussed above, they provide the species with adaptive flexibility, which has great survival value. They are still classified as Individual Survival Needs because, if they are not met, the individual dies or is damaged, whereas with Species Survival Needs, the individual can survive if the needs are not met. Developmental needs exist in all species, except those, perhaps, that reproduce by simply dividing. Developmental needs consist of those environmental conditions, that must be met, for the egg, the larvae, the pupae, the foetus, the seed etc to survive. Developmental needs also consist of those things which must happen, or not happen, as the case may be, for the young organism to move undamaged, into maturity. The length of the developmental period influences how much environmental input can be absorbed and therefore how much behavioral variety and other attributes the species can exhibit (still within parameters). There is a great deal of evidence, which is discussed in the book, regarding the time limitations on developmental needs, within a variety of species. During the developmental time 'window', there is considerable flexibility as to when and how the need is met. Once the time window is closed, however, if the need has not been met properly, it is difficult, if not impossible, to effect a change in the affected functioning of the individual.

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Species Survival Need Classes:

The needs represented by these need classes are essential to, or facilitate, the survival of any given species, but are not essential, to the survival of the individual member of that species. In fact, they tend to put the individual at risk. Again, the specific needs in each of these classes will vary by species.

The Reproductive Need Class

The ability to self-reproduce is an emergent property of living structures. Since, because of the second law of thermodynamics, all structures eventually deteriorate, life and the evolution of life would not be possible without the reproductive capacity. We include procreation and parental care (where it exists) in the Reproductive Need Class. Because of the competition of the safety needs, natural selection has outfitted the reproductive needs with strong internal drives. Individuals without these strong drives tend not to reproduce. The reproductive risks to the individual are considerable. For example, the annual rut among many species is life-threatening to the males, and human females have faced a high probability of death in childbirth, which has only recently been abated in some cultures. The Class of Reproductive Needs is operative only in the mature organism.

The Class of Needs Associated With Species Specific Survival Strategies

This class of needs, again, is operative only in mature organisms, but the developmental needs of the members of each species will be affected by the species survival strategies. For example, the developmental needs of a young social animal will be different from the developmental needs of a young member of a solitary predator species. In the book, we discuss John Nash and game theory, in the context of survival strategies. [18, 19]

Species-specific survival strategies include behaviors such as: *social behavior, intelligence, migration (seasonally or on an as needed basis), hibernation/torpor or the periodic slowing down of biological (thermodynamic) processes, and the ability to fabricate.* (There are many additional strategies discussed in the book.)

Notice that these emergent behaviors can also be described as behaviors of our DNA. They reappear at the structural level of the whole organism in some, but not all, species. It is clear that these and other survival strategies are genetically driven. It is also clear that they are genetically separate, because, while they can emerge together in the same species, they do not always do so. Further, when they emerge they tend to have the same characteristics. This is suggestive, of the possibility, that they represent the emergence of a behavioral potential, rather than separate evolutionary development in each species. Our book spends considerable time on these behaviors. We will here, briefly discuss, only two, which are obviously strongly associated with human nature. These two, are social behavior and intelligence.

Social Behavior

Social behavior is one of the most highly successful survival strategies. It is found in single- celled bacteria, in insects and other invertebrates, in birds and in mammals. Significantly, it is not found in all bacteria, insects and other invertebrates, birds, or mammals. When it emerges, it always has the following characteristics: *dependence of the individual upon the group, a division of labor, a social hierarchy, a group behavior code, communication among group members and the capacity of the individual for self- sacrifice.*

In the book, we will demonstrate that these characteristic behaviors are documented and striking. All social groups have a behavior code, because group action is facilitated by the predictable behavior of individual members. Deviant behavior exists, but is punished by the group. Individuals in a social species compete for social status or dominance in the group. We suggest that the function of dominance is, also, to enforce predictable behavior on the part of individual group members. In social species there is a 'survival need' for a behavior code. Even criminal groups have their code of conduct. (Pointing out that there is a survival need for a moral code, does not obviate the possibility that moral codes may be revealed, in the event, that we are not quite up to the task of developing the best ones by ourselves.)

Richard Dawkins, and others, have had difficulty explaining what they refer to as 'altruistic' or selfless behavior. We point out that it exists in all social species and agree that it is genetically driven. War would not be possible without the behavioral capacity for individual risk-taking/self-sacrifice on behalf of the group. Only social species engage in group conflict. (Group conflict also requires cooperation.) Suicide would not be possible without the behavioral capacity for self-sacrifice. It also underlies all heroic and sacrificial behavior. The self reports of individuals who dove into a river to save man or animal, or who engaged in other such heroic behavior, typically are, that, "I had an adrenalin rush and had no thoughts for my own safety." This is clearly, genetically driven, and represents the override of the safety needs, by the species-specific survival strategy of social behavior. Individual self-sacrifice benefits the group. This behavioral capacity for self-sacrifice, lends itself to risk-taking behavior, such as exploration, which individuals in social species undertake, on behalf of the group. Sacrifice and self-sacrifice plays a huge role in human religions and mythologies.

There can also be competition between the individual and the group. The survival function of the group is to provide predictability so that the cooperative behavior of group members is possible. The survival function of the individual, in a social species, is to provide adaptive change. The function of adaptive change is driven by the need to self-actualize. The need to self-actualize can bring the individual into conflict with the group and, internally, with his/her own need for the support of the group and his/her own need to avoid the punishment of the group. Change rarely occurs without conflict and sacrifice. Change, not only conflicts with the survival function of the group for predictability, it also upsets the social dominance hierarchy, which can be very dangerous for the change/agent individual. We have the examples of Jesus, Socrates, Galileo, and countless others, to contemplate in this regard. What drove them to face death, rather than compromise their beliefs? We suggest, that it is the power of emergence, as represented in the drive to self-actualize. (Galileo did recant, thus saving his life, recognizing that the "truth was out there.". He still stands as a beacon to those who defy the system.)

This is not to diminish the importance of predictability. Predictability is very important for social and economic (survival) functioning, and humans will choose predictability over chaotic freedom. Also, successful change-agent individuals can wreak great havoc on society. We discuss the complexities of this competition between the individual and the group in the book. Thomas Sowell is a resource in this discussion. [20,21]

Intelligence

Intelligence, or the ability to learn from, or adapt to, the environment, is a survival strategy of many species. Researchers, observing the behavior of species, other than human, are becoming increasingly aware, and are reporting, how intelligence is operative in many species, in which it has not been suspected. The book will report the details. Intelligence enables, and requires, a world-view, so that individual members of the species, can move purposefully to meet needs. Intelligent species, such as bears and parrots, learn what foods are available, when and where. Humans also develop world-views. Because of our need for predictability, as a basis for cooperation, we compete over our world-views - often violently. (This need for predictability is why cultural diversity does not work over the long haul. Sooner or later one culture becomes dominant, though it may well incorporate attributes of other cultures.)

The ability to record, store, organize, retrieve, communicate, and otherwise act upon information from the environment is an emergent property of life found in our DNA. Other than the epigenetic effects upon genetic material, change in DNA, based upon environmental information, requires generations of individuals. Intelligence is the ability to effect change, based upon environmental information, within a single generation. The development of an organ was necessary to accomplish that, and that organ is the brain. The brain does just what the DNA does, though on a basis that is more prompt and more comprehensive. It records, stores, organizes, retrieves, communicates and otherwise acts upon environmental information. Philosophers have long pondered the nature of 'mind'. It is obviously an organ that facilitates survival, by providing information upon which action may be based. It also 'expresses' the emergent genetic drive to self-actualize, which includes the genetic ability to fabricate/create, and to comprehend. It is directional, as are the actions of the sub-atomic particles. Mind is clearly emergent. It is also, clearly, a part of the whole. In the book, we discuss aspects of the mind. We distinguish between 'awareness', (the limbic system information about feeling states, "I feel cold, I feel secure, I feel hunger, I feel fear,") from 'higher' functioning mental activities, and raise the question of whether limbic system awareness still exists in individuals pronounced 'brain dead'. (New evidence has just come out that this is, indeed, the case, at least for some individuals.) Explaining the mind, in a thoroughly corporeal fashion, does not obviate the possibility that something else exists. If energy and matter, can emerge from we know not what, and life, can emerge from energy and matter, who are we to say, that the soul cannot emerge from life. We do not need to prove it and we cannot disprove it. There are different ways of knowing. Arriving at an agreed-upon consensus about knowledge (the world view) is one thing, but knowledge is still, as Edelman has experimentally discovered, and to which Crick agrees, a unique and individual thing. Crick, equated awareness with consciousness, and devotes his book, **The Astonishing Hypothesis**, to the topic. We discuss this in the book. [22-24]

The Species Survival Strategy of 'intelligence' includes an attribute called 'curiosity'. Curiosity drives individuals to explore and to learn. Curiosity can come into conflict with the safety needs, as in the old adage 'Curiosity killed the cat'. (Curious cats out of the box face the same probability risks as Schrödinger's poor cat in the box. And we all know that, for cats, it is one chance in ten.) Curiosity is the attribute responsible for all knowledge. The curiosity associated with intelligence, combined with the capacity for risk taking self-sacrifice, which is associated with social behavior, is a powerful combination. That, combined with the large brain for storing information, has resulted in the dominance of the human species. (Lest we get too carried away with our hubris, the simple species survival strategy of the virus - which is rapid mutation - may yet destroy us.)

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The Need to Self-Actualize is in a class by itself. Self-actualization is not essential to the survival of the individual, unless we agree that it is the 'vitalism' that drives all behavior. Self-actualization, by producing adaptive change, contributes greatly to the survival of the species of which the individual is a member. As we have pointed out, it can put the individual into conflict with the group in a social species. As Maslow has pointed out, a talent constitutes a need, so that individuals with great talent have a strong need to express that talent or ability. Genes exhibit a drive toward phenotypic self-expression. Maslow called it the 'drive to self-actualize'. Sigmund Freud (1856-1939) called it the 'libido'. Medical doctors call it the 'will to live'. Other philosophers have called it 'vitalism'. In his book, *Of Molecules and Men*, Crick, argues against the concept of 'vitalism'. Others have disputed these terms, and the process they represent. We suggest that there has to be such a force, though it has not yet been identified as such by physicists. [25] [26]

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In the book, we analyze the role that competition for social power plays in human societies. Competition can be active or passive, positive or negative. Negative competition consists of succeeding by handicapping or holding other competitors back, by oppressing competitors, or by simply killing them. We have developed a classification system for human societies, including multi-class societies, single class societies, and intentional communities, based upon how social power is distributed either from the top down or the bottom up. We believe that there is biological unity beneath cultural diversity and that human cultures vary in their ability to meet human needs and produce human happiness. Respecting human cultural diversity, is not the same as respecting the rights of individuals to seek their own destiny, as long as they do not interfere with the rights of others to do the same. <u>Positive human cultural advancement, is dependent upon the self-actualization drive of individuals</u>. As we pointed out, the function of the group is to promote stability and to resist change, including the challenge of new ideas, a situation with which the members of this Association are very experienced. Competition for social power, among group members, and the competition of worldviews, will determine what is 'politically correct' in any given group. As a member of the Russian Politburo, informed the grandfather of the author of this upcoming book, "We do not tolerate dissent." We discuss, in the book, that which we call 'the primary Platonic error', which is the belief, enunciated by Plato (c. 428 – c. 348), that a small group of 'intellectuals' can be trusted to have the wisdom and forbearance to successfully control the lives of others. [27]

There is competition between species, which humans are attempting to mitigate. There is competition between groups within species, which within our own species, humans have learned to mitigate and channel through a balance of powers system. There is competition between individuals within groups, which, in humans, can be mitigated and channeled by the rule of law, which is an evolutionary development of the social species survival requirement of a behavior code. There is competition, within the individual, between his/her survival needs. Freud articulated need conflict, within the individual, with his postulation of the id, the ego, and the superego. He saw the id as being primarily the sexual drive, but, as we point out, there is need conflict, even within the id, between the safety needs, the self-maintenance needs, the species survival needs and the self-actualization need or drive, all of which compete for the available energy of the living structure. Freud also discerned the human capacity for self-sacrifice. He called it the 'death wish'. All competition stems from the scarcity, and the struggle for survival, imposed by the laws of thermodynamics. Emergence and creativity can mitigate the impact of scarcity and competition, but cannot eliminate it.

As any parent knows, situations frequently arise when there is need conflict between the parent and the child. Part of the responsibility of parenting is, to 'set limits', for the child, in terms of the child's expectations of need gratification. However, there are also developmental needs that must be met for the child to mature normally. Whether or not those needs get met, depends upon the environmental situation in which the parent is operating, and, the degree to which the parent's own developmental needs were properly met. The psychologist Harry Harlow (1905-1981) demonstrated that maternally deprived monkeys were barely able to successfully engage in sex, and their parenting skills were a disaster. Similar outcomes have been demonstrated in mice. Ethologists, observing solitary animals in the wild, remark upon how experience in parenting, measured by the number of previous offspring, is a good predictor of how successful a mother will be in raising her young to maturity. One of the benefits of social behavior is that experience can be shared, and environmental conditions mitigated, by other members of the group. (Competition can also be exacerbated.) These issues are discussed at length in the book. [28]

God did point out that this would not be the Garden of Eden. In the book, we examine the views of human nature, which are reflected in the world's great religions and in human mythology. It is our assessment, that the Christian view of human nature, as articulated by St. Paul, is the closest to what we believe to be, the scientific evidence, as presented here. Our competitive survival needs represent our 'feet of clay'. Our emergent drive to self-actualize and to be 'at one with the universe' represent our angelic potential. [29] [30]

* * * * * *

In the book, we do not deal with issues of physics much beyond the laws of thermodynamics and the concept of emergence, because physics is not an area in which we have any expertise. Physics has, however, had a great influence on philosophy (and the reverse), and philosophy and the philosophy of physics have had a great influence upon concepts of human nature. We therefore feel the need to address as best we can the issue of the fundamental nature of reality. What we discuss below are potential 'explanatory hypotheses' coming from a biological perspective. Cynthia Whitney used the phrase 'explanatory hypothesis' in her review of the Graneau book (discussed below) to distinguish theory from experimental fact. She observed that the distinction between the two has become quite blurred. In our book, we try to keep fact and theory separated. [31]

Let me begin, by stating our position on the nature of reality. Reality exists, independent of the observer. (Since the observer is also 'real', the observer and that which is being observed can be conceived as a system and, in fact, much research is done on this 'system.') As we have pointed out, survival depends upon knowledge of the environment so that survival needs may be met. As Edelman points out, as we discussed above, each individual organism builds an idiosyncratic picture of the environment in which it exists. That idiosyncratic picture is partially selected from previously selected bits of information, provided by our DNA, based upon environmental input as suggested by Edelman. (This supports Kant's *a priori* knowledge.) In social species, this information is consciously shared. A consensus, as to environmental conditions, is more or less arrived at. This consensus is probabilistic rather than deterministic. All species 'explore' their environment to some degree. Social species share information based upon that exploration. Species such as bears, which are basically non-social, but which exhibit the maternal social function, share information between the mother and the offspring. The human species has developed strategies and instruments for gaining environmental information, but those strategies and instruments are relatively recent in terms of the history of life in this universe. So, it might be said, that we are still at the threshold of conscious environmental knowledge. Our DNA, through natural selection, has extensive environmental knowledge, and it behooves us to come to grips with that information, meaning, we need a better understanding of how survival needs, and the intra- and inter- personal competition between those needs, drive our behavior. We need this information if we hope to solve human problems. Murray Gell-Mann refers to this as an 'information-gathering and utilizing system' (IGUS.) Francis Crick has similar views, which we discuss in the book. This view of reality, all hinges on scarcity - the finite amount of energy and its permutation, matter. [32] [33]

Special Relativity

What Einstein proposed, in his Special Theory of Relativity, is that matter has energy and energy has mass. In our view, $E = Mc^2$ and $M = E / c^2$ <u>is</u> his unified theory. We propose that matter and energy, and their various permutations, are all there is in our Universe. The permutations of matter and energy occur, according to thermodynamic processes. Space and time have an independent existence. Matter and energy have to exist within space and time, because space and time are essential to the operation of thermodynamic processes. Space provides the cold sink, and sequential time, permits the thermodynamic sequence. [34]

With regard to the dual nature of light as wave and particle, Werner Heisenberg points out that conceptually, 'wave' means energy and 'particle' means matter. Since we know that the two are interchangeable, is not what we are observing, in the behavior of light, the transition of light from energy to matter and back again? Energy is 'captured' or 'bound' to create matter. In his *Opticks (1704)*, *Question 30*, Isaac Newton (1642-1727) asks, "*Are not gross Bodies and Light convertible into one another, and may not Bodies receive much of their Activity from the Particles of Light which enter into their Composition?......The changing of Bodies into Light, and Light into Bodies, is very conformable to the Course of Nature, which seems delighted with Transmutations.* [35, 36]

If we hope to understand the nature of the Universe, we should focus on such matters as: under what conditions does light behave as a wave and under what conditions does light behave as a particle? Structure is a function of/is dependent upon lower level environmental conditions, recognizing that lower level environmental conditions are various permutations of matter and energy. For example, living structure can only exist within certain parameters of temperature and pressure. What are the conditions that produce particles, and what are the conditions that produce waves? (Wave behavior is another pattern of behavior that may be observed at different levels of structural complexity.)

The November 21, 2008 edition of *Science* reported that it has been established that the source of mass of everyday matter is consistent with quantum chromodynamics, which states, that the mass of particles such as neutrons and protons results from the exchanges between quarks and gluons, which carry the strong nuclear force. Does this not help to unify the forces? Mass is an emergent property of the strong nuclear force under certain conditions?

General Relativity

In their book, *Newton versus Einstein*, (reviewed by Cynthia Whitney in the May/June 1994 issue of *Galilean Electrodynamics*), Peter and Neal Graneau argue the case, and provide experimental evidence, for gravitational 'distant/non-local action'. Roger Penrose points out in his book, *The Large, The Small and The Human Mind (1997*), that quantum action is non-local. Describing gravity as an emergent property of mass, places gravity in good company with the many other emergent properties in this Universe, whose origin cannot as yet be explained, such as the origin of matter and energy and the origin of life. It makes disbelief in 'distant/nonlocal action' harder to defend. Newton, however, did object to this concept. In the July 16,1717, advertisement for his second edition of the Optiks, he states: *And to shew that I do not take gravity for an essential Property of Bodies, I have added one Question concerning its Cause, chusing to propose it by way of a Question, because I am not yet satisfied about it for want of Experiments.* We may consider the experiments conducted by the Graneaus, and we may recognize that classifying gravity with other emergent properties, whose causes are unknown, does not violate

Newton's phrase, *Hypotheses non fingo*, as applied to gravitation. [37-39]

Einstein recognized that theorists can be influenced by the particular paradigm with which they are working; that is, by their world view. In his *Autobiographical Notes* written in 1949, he states:

The antipathy of these scholars (e.g. Ostwald, Mach) towards atomic theory can indubitably be traced back to their positivistic philosophical attitude. This is an interesting example of the fact that even scholars of audacious spirit and fine instinct can be obstructed in the interpretation of facts by philosophical prejudices. The prejudice - which has by no means died out in the meantime - consists in the faith that facts by themselves can and should yield scientific knowledge without free conceptual construction. Such a misconception is possible only because one does not easily become aware of the free choice of such concepts, which, through verification and long usage appear to be immediately connected with the empirical material. [40]

As Dr. Whitney pointed out in her excellent review of the Graneau book, in seeking additional universal laws, Einstein adopted a paradigm which tied him into the concept of local action, as opposed to action at a distance, that is, non-local action. In his book, *Relativity - The Special and the General Theory - A Popular Exposition, (1916*), Einstein states:

The success of the Faraday-Maxwell interpretation of electromagnetic action at a distance resulted in physicists becoming convinced that there are no such things as instantaneous actions at a distance (not involving an intermediary medium) of the type of Newton's law of gravitation. According to the theory of relativity, action at a distance with the velocity of light always takes the place of instantaneous action at a distance or of action at a distance with an infinite velocity of transmission." [41]

Einstein needed a field within which gravity could operate as a local action. He rejected the 'ether' and chose Minkowski 'space/time'. As Eddington pointed out in his Gifford lectures, the problem Einstein was solving, in his theory of General Relativity, was the contraction of matter. He solved it by adjusting the measuring sticks of time and space. Now, what we learn from his successful solution, is that the behavior of matter is lawful, because, by consistently adjusting the measuring sticks we get consistent results. This meets the needs of physicists, but it begs the question of what causes matter to contract. To borrow a phrase from Heisenberg, "It is very good physics, but very bad philosophy." (Heisenberg applied this statement to particle physics. We apply it to General Relativity.) [42, 43]

In his book, *The Evolution of Physics*, written with Leopold Infeld, Einstein states:

Time is determined by clocks, space coordinates by rods, and the result of their determination may depend on the behavior of these clocks and rods when in motion. There is no reason to believe that they will behave in the way we should like them to. Observation shows, indirectly, through the phenomenon of the electromagnetic field, that a moving clock changes its rhythm, a rod its length.....
We must accept the concept of relative time in every CS, because it is the best way out of our difficulties.

High velocity causes changes in the material measuring instruments. For physicists and engineers, this change in measured 'time' and 'space' is important. It does not necessarily philosophically follow that fundamental time and space have changed. Matter has changed. Einstein believed that it is the electromagnetic field that causes the change in matter. We propose that it is the internal dynamics of matter and energy at high velocity that produces - causes - the change. [44]

We propose that Einstein's General Theory of Relativity is an extremely accurate picture of the geometric relationships of matter and energy in the cosmos, but that it errs as to the cause of that relationship. It is time and space that get jerked around by matter and energy, not the reverse. Gravity and inertia are emergent properties of mass. Gravity and inertia are equal and opposing (except in free fall), but are not direct opposites, which is why geometry is required to explain their relationship, and why gravity, under certain conditions, can get leverage over inertia. Einstein eliminated inertia from his theory of General Relativity and he hoped to eliminate all of matter leaving only the field. He did not succeed. Einstein believed that by describing the structure of the field he would avoid the necessity to describe the structure of matter. We were amazed to discover that the space-time continuum is a graph! Any social scientist knows that establishing a correlation does not establish causation. Einstein, to the contrary (?), we believe that the only way to properly graph space is as a three dimensional point and the only way to properly graph time is as a point or an interval. [45]

We propose that matter and energy are emergent. We propose that mass is an emergent property of matter and energy, and that gravity and inertia are emergent properties of mass. We propose that gravity and inertia are competitive forces that, together, maintain the cosmic structure. We suggest that black holes may represent inertial collapse rather than gravitational collapse. We observe that black holes are thermodynamic systems, in that they have temperature, entropy, and they emit useful energy, in the form of Hawking radiation. Penrose points out that entropy increases in cosmic structures (black holes) as mass increases - the opposite of what occurs in a gas. This suggests that entropy increases as movement occurs along the gradient, in both directions, away from the thermodynamic conditions supporting liquid, which is also, roughly, the thermodynamic conditions supporting life. We propose that black holes may be the result of that unnamed spontaneous tendency toward increasing entropy; namely, an expression of the second law of thermodynamics. As such, this spontaneous tendency is as destructive to cosmic structures as it is to living structures. We propose that black holes may serve as energy recycle bins of the universe, just as living structures recycle energy. The energy recycling process, in both instances, begins with the consumption of matter and energy. [46]

Erik Verlinde of the University of Amsterdam is proposing that gravity is an 'entropic' force, emerging from the interplay of mass, time, and space. Verlinde sees gravity as emergent, and he sees it as somehow related to entropy, so he may get there, especially if he uses space and time as measures and not actors. [47]

In the March/April 2010 issue of *Galilean Electrodynamics*, Morton F. Spears provides a very promising approach in the article, "An Electrostatic Solution for the Gravity Force and the Value of G ." This theory operates equally at all levels of structural complexity, including quantum gravity. Causation resides in the electrical energy stored in matter that can be projected onto the 'field'. 'Field' forces can be suppressed. The effective radius of the 'field' and the mass of the whole is always equal to or less than the sum of the radii and mass of the particles composing the whole. The theory can also be utilized to derive the force of inertia. [48]

Mathematics provides an accurate description of relationships. However, mathematical formulas are reversible. Causation is directional. Therefore, understanding causation requires, as Einstein points out above, the next step of concept formation/theory building. Because of the theory of relativity, many physicists have come to believe that the measuring sticks of time and space are causative agents in the behavior of matter. An example, is the belief, that the increased 'life span' of the sub atomic particle, the muon, at high velocity, is the result of time 'dilation'. What is the causal connection between time and the muon? As we point out above, structure is a function of/ is dependent upon environmental conditions. We know the 'life span of' the muon under certain parameters. It changes under other parameters. This is an experimental fact. We assert that time 'dilation' is not an acceptable explanatory hypothesis for this fact.

Heisenberg was very grateful to the muon for validating the theory of relativity. We have the choice of considering that the muon, at high velocities, is on the way to a long and happy life, or that the muon is on the way to being frozen in time. We choose the latter explanation. Einstein agreed, though for different reasons. We propose that the speed of light, and absolute zero temperature, are thermodynamic boundaries to our matter and energy universe. At these boundary conditions, the spontaneous tendency for increase in entropy, ceases to operate. Heisenberg refers to thermodynamics as the theory of heat. He points out, that the theory of heat is a consistent theory in its final form, and that this theory is also consistent with three other theoretical systems that are fully developed. These three systems are: (1) Newtonian mechanics; (2) electromagnetism, special relativity, optics and magnetism; and (3) quantum theory. He stated that the theory of heat is especially consistent with the quantum theory. He believed, at that time, 1958, that the set of concepts connected to the theory of general relativity had not yet reached their final form and that general relativity was distinctly different from the other four sets. We propose that if we substitute entropy, gravity and inertia as dynamic actors, instead of time and space, we may be able to integrate general relativity with the other systems as well. [49] [50, 51]

In the 1958 Gifford Lectures, Heisenberg states, But the possibility of empty space has always been a controversial problem in philosophy. In the theory of general relativity the answer is given that geometry is produced by matter, or matter by geometry. We remind the philosophers, that thermodynamic processes cannot take place without empty space for the cold sink. Empty space is essential for the functioning of our matter and energy system. Matter and energy exist within empty space, and they fill or empty that space as the thermodynamic processes proceed. [52]

Einstein established, that the speed of light is a constant. This means that the speed of light can be used to measure time and space in the cosmos and, through measurements of time and space, the relationships between objects, and between events, in the cosmos, can also be measured. However, for these measurements to be meaningful, it would seem, that time and space must be constants as well. According to the theory of relativity, velocities are relative to the observer. Only the speed of light appears as a constant to all observers. What would happen if, for purposes of physics, we summed the velocities of objects and represented that sum as a deviation from the speed of light? If all velocities were represented as a deviation from the speed of light, it would represent a consistent measurement of velocity.

Quantum Mechanics

We agree with Peter F. Erickson, on the absolute nature of time and space. There is no past or future to travel to. The quantum world (and entropy) teaches us this, in the lack of reversibility, and the fact that actions preclude other actions. There is directionality. In a material world, past events leave material records (including human memory), which are a source of information, but the past no longer exists. The future does not exist. Events in the 'now' moment 'create' the future next moment into infinity. Again, the sequence of the moments of time is also essential to the functioning of thermodynamic systems. It is the instruments to measure time and space, which are the challenge. With regard to Peter Erickson's article on *The Nature of Time* in the last edition of the *NPA Proceedings*, we would like to observe that, in our view, memory, like our DNA, is a part of the emergent property of living matter, which permits the recording, storage, retrieval and communication of information that facilitates survival. [53, 54]

We propose, that time, the infinite series of 'now' instants, is essential to effect 'choice'. 'Choice' is that irreversible action which limits future 'choices', which is described in the quantum mechanics of sub-atomic particles. Time is neutral with respect to the 'choice', but its inevitable progression ensures a sequence of 'choice'. The sequence of choice is essential to the creation of structure. Structures are 'built', 'choice' by 'choice'.

We propose, that the existence of 'choice' is the essence of 'free will'. What free will means, is that the choice, that will be made, is not predetermined. It may occur within limiting parameters of choice, and the chooser may be compromised by personal damage or external circumstances, but the outcome is not pre-determined. Father Stanley L. Jaki (1924-2009), in his essay, *The Cosmic Myth of Chance*, which is found in his book, *The Only Chaos and Other Essays (1990)*, objects to the use of quantum mechanics as an explanation of free will. Suffice it to say, here, that human behavior, as we propose, is driven by competitive survival requirements. Competition necessitates choice, and it is choice, not chance, which we see as operative. Crick, Schrödinger, Edelman, Gell-Mann, Eddington and Penrose also contributed to this argument, which we discuss in the book. Opening the door to choice, necessarily and irrevocably, opens the door, as well, to chance, to error and to evil. Penrose postulates that the quantum choice may be made by the 'environment' - by one of the space/time frames. This proposal is very similar to Darwinian 'natural selection'. We propose that, in an evolutionary sense, increasingly complex structure emerged in our universe and, eventually, the possibility of conscious choice appeared. [55-61]

There is much similarity between the behavior of quantum particles and biological organisms. As is well known, the first experimental observation of the behavior of atoms was that by the botanist Robert Brown (1773-1858), who also named the nucleus. In the book, we discuss Niels Bohr's (1885-1962), concept of 'complementarity' in this regard. Toward the end of his life, Bohr observed, in his essay, *Quantum Physics and Philosophy: Causality and Complementarity (1958),* that in his notion of relativity, Einstein recognized, that the description of physical phenomena, depends upon the reference frame chosen by the observer. He goes on to point out that in quantum physics, the description of physical phenomena must include a description of the experimental procedure chosen as well. In classical physics, the interaction between object and apparatus can be neglected or compensated for. In quantum physics, this interaction forms an inseparable part of the phenomenon. Nonetheless, he recognizes that these experiments represent objective information about the physical phenomenon under observation. Information from different experimental approaches can be put together in a complementary way to construct an objective description of the phenomenon in question. He believed that this same approach can be utilized to advantage in the biological and the social sciences whenever the measurement apparatus forms an integral part of the phenomenon under observation. He concludes: *...the gradual development of an appropriate terminology for the description of the simpler situation in physical science* (as opposed to biological and social science) *indicates that we are not dealing with more or less vague analogies, but with clear examples of logical relations which, in different contexts, are met with in wider fields.* May we say, "Our point exactly!" We also point out the obvious, that Einstein's genius contributed to the development of quantum theory in numerous ways. [62]

Penrose points out, in discussing quantum mechanics:

In quantum mechanics, one has to consider that the various possible things that "might" happen, in a physical situation, can all contribute to the quantum state, and therefore all these alternatives have an influence on whatever it is that does happen.

This is exactly what the biological and the social sciences have to deal with. [63]

In The Quantum Enigma (1995), Wolfgang Smith quotes Heisenberg from his book Physics and Philosophy (1958):

If one follows the great difficulty which even eminent scientists like Einstein have in understanding and accepting the Copenhagen interpretation of quantum theory, one can trace the roots of this difficulty to the Cartesian partition. This partition has penetrated deeply into the human mind during the three centuries following Descartes, and it will take a long time for it to be replaced by a really different attitude toward the problem of reality.

Instead of the Cartesian bifurcation of mind and matter, Smith distinguishes between the 'physical world' and the 'corporeal world'. In his view, the 'physical world' is the fundamental quantum world of potential, and the 'corporeal world' is the 'actualized', normally observable world. We refer to these, as different levels of structural complexity in the 'real' world, because we see at least one more level, where potential is actualized, and that is the living world (which Smith intimates might be the case). The evidence for this is discussed in the book. In common parlance, the observation is frequently made that individuals either have, or have not, 'actualized their potential'. The collapse of the state vector, may be seen as the prototype of all emergence, with its 'unpredictable' properties. Smith sees the collapse of the state vector, as the transition between the 'physical world/level' of potential, and the 'observable world/level of the expressed, or actualized'. Emergence may be the phenomenon that occurs at the transition between all levels of structural complexity. The quantum energy jumps may also signify this transition between levels. [64]

The 'collapse of the state vector' is one of the mysteries of quantum behavior. A probe is inserted and behavior changes. Where have we seen that before? A probe is inserted next to a single celled amoeba, and the amoeba stops what it is doing, and withdraws. In living structures, it is called awareness - responsiveness to stimuli. It is a mysterious, emergent property of life. We have become accustomed to it, but the ability to respond to stimuli, is very mysterious, even in living structures. Is it possible, that the ability to respond to stimuli, is a property of matter, which is expressed at more than one level? As we have said, there is much in the probabilistic behavior of quantum particles, which parallels the probabilistic behavior of living structures. The behavior of the structural levels, in between quantum particles and living structures, is, fortunately for us, much more deterministic. (This fact, might be additional evidence for the anthropic principle.) Deterministic behavior, may also be an emergent property, at the atomic level of structural complexity, which cannot be predicted, based upon behavior at the subatomic level of structural complexity.

In *The Quantum Enigma*, Smith further states:

The crucial fact is that eigenstates of the total energy (which is always an observable of the system) turn out to be stationary states: states which do not change at all. The fact that energy eigenstates are stationary, however, does not imply that energy eigenvectors are constant..............Energy eigenvectors, thus, engage in a ceaseless rotatory motion, the frequency of which is proportional to the corresponding energy. Is this not a description of our universe*? [65]*

Information Theory

If all matter has the capacity to respond to stimuli at some level or other, then information awareness/sharing may account for quantum entanglement and gravitational attraction. If this is so, then Claude Shannon's (1916-2001) 1948 formula for information certainty/uncertainty may be another general law of nature which applies at all levels of structural complexity under any conditions. His formula equates information with entropy or disorder/uncertainty. The greater the entropy-uncertainty, the more information and the greater freedom of choice is. The lesser the entropy-uncertainty, the less the information and the less the freedom of choice is. The greatest degree of uncertainty, for a single choice of one of two options, is represented by the coin toss - the 50 -50 chance. The least degree of uncertainty is 100 - 0 chance, which is, by definition, certainty. All communications can be evaluated on this scale, as to the certainty of the message getting through. (When dealing with large numbers of individuals, with differing probabilities in their individual choice, statistical methods become necessary.) [66]

Einstein suggested the possibility of a signal accounting for gravity and quantum entanglement. However, a signal is disallowed because it would have to travel faster than the speed of light. It would be disallowed if it were corporeal i.e., it had mass. What if the signal is not corporeal, but emergent and similar to consciousness/awareness with a built-in receptor like the goslings described below? We are not, at this time, proposing this. Like Newton, we simply ask the question. This may lead us into

Stephen Hawking's musings on time travel. How strange if the path of reductionism and the path of emergence end up at the same place. Certainly, Stephen Hawking must understand, better than anyone, the power of the mind. [67] [68] [69]

Many, including Penrose, have commented upon the similarities of human mental functioning to that of computers. Edelman and Crick have objected to this. (Penrose is more circumspect than some others.) Our observation, on this disagreement, is that, the similarity between the human mind and computers is the programming language. The programming language is the binary language in both instances. Humans program computers. Natural selection programs humans. The decision tree in humans is infinitely more complex than the decision tree in computers; however, the binary language is still the same: yes-no, stop-go, heads-tails, excite-inhibit. It is the language of choice. It is competitive choice. The choice has to be one or the other. It cannot be both (unless you are a photon?) Once a choice has been made, another choice is presented. The subsequent choice is affected by the preceding choice. I think that this is what the behavior of quantum particles is telling us about how the world works, because this is how the world works in its emergent, creative aspects. Edelman points out, that habitual behaviors require less and less conscious attention and become more and more efficient in the use of mental energy. When a choice is presented, however, it always results in a slowing of mental activity and a focusing of consciousness. Penrose reports on research, which demonstrates that brain activity proceeds by a second or more, the report of conscious awareness. This certainly supports consciousness as an emergent phenomenon. [70-72]

The Creation, Maintenance and Dissolution of Structure

One problem we are focused upon is what forces drive the formation and dissolution of material structure. The 'zoo', of subatomic particles, is an illustration of our corollary to the first law of thermodynamics. Not all of the conceivable subatomic particles can exist simultaneously. Subatomic particles are, in effect, competitive. They are also emergent. They are not always the component parts of other particles. They can emerge, with their surprising properties, as a result of high-energy collisions of other particles. They represent, as Heisenberg points out in a 1975 lecture to the German Physical Society, *What is an Elementary Particle*, (and elsewhere), the creation of matter from energy. They are being studied now, under artificial conditions. This is useful for nano-technology, and our attempts to fabricate (an emergent property of life which we discuss in the book), new kinds and degrees of need satisfiers. In their book, *Subatomic Physics (2007*), Ernest M.Henley and Alejandro Garcia, report that subatomic physicists, have identified three forces which contribute to decay: hadronic decay, electromagnetic decay and weak (nuclear) decay. There is a suggestion that these forces may be one force. Particles decay into their component parts. Some of the decay is spontaneous. The spontaneous increase in entropy? "*The data suggest that a particle decays if it can and that it is stable only if there is no state of lower energy (mass) to which it is allowed to decay.*" Limits on the levels of decay provide stability. Information is being gathered, on how the strong nuclear force produces 'coupling constants'. Again, there are limits, in that, the strong nuclear force exhibits 'saturation'. One particle attracts only a limited number of others. It takes an infinite energy to liberate a quark from an anti-quark and therefore the pair are 'confined'. Science is, therefore, gaining information on the dissolution and maintenance of structure. So, what drives the formation of structure? According to the biochemists, Mathews, Van Holde and Ahern, "*For all chemical and physical processes, it is the competition of enthalpy and entropy terms that determines the favorable direction.*" Why, at this stage in our knowledge, are enthalpy and entropy still considered only accounting terms? [73-75]

We propose, for consideration, that the fundamental forces of the universe, identified thus far, namely gravity, the strong nuclear force and, to some degree, the electromagnetic force are all forces which bind structure. (The weak nuclear force destroys structure, though particles can be created in the process of decay.) The common principle is bonding. The bonding action can be non-local, that is, action at a distance. Bonding is a behavior, which occurs at various levels of structural complexity. It includes chemical bonds and quantum entanglement, as well as, the parent-child bond, the pair- bond, and the fraternal bond which can be observed in living structures. Understanding gravity as a bonding process may help to unite gravity and the quantum world. Bonding works differently, at different levels of structural complexity, but it is always based upon information and mutual recognition. The 'field' is simply the spatial area within which the information (message) may be effectively communicated. According to Henley and Garcia: $R = h/mc$. Range (in sub atomic terms) is inversely proportional to the mass of the quantum. That has a nice classical ring to it. [76]

We propose that entropy is a form of energy dedicated to the dissolution of structure. The electro-weak force is another such form of energy. Logic tells us that there must be a form of energy that is dedicated to the creation of structure. We suggest that irreversibility is a signpost of such a form of energy. Logic tells us that irreversibility is necessary for the creation of structure. You cannot create structure if the foundation comes and goes. A clue to the nature of the energy, which drives the creation of structure, is that, like the spontaneous tendency toward increasing entropy, it may not have a time parameter, but it will require a directional time sequence. Since entropy is relentless, the creative drive may be characterized by persistence. Try and try again. Is this enthalpy?

In the 2007 edition of these NPA Proceedings, Cynthia Whitney provided a very profound approach to the Periodic Table by presenting it as the Periodic Arch. The Arch is a pattern frequently found in nature. She presents a graph of ionization potentials, derived from algebra, which resembles the periodicity of the normal sinus rhythm in an electrocardiogram of a human heart. The original Periodic Table permitted the prediction of the existence of additional elements. Whitney's Periodic Arch, and accompanying algebraic equations, permit the prediction of the ionization potentials of elements currently known and unknown. The Periodic Arch and Whitney's adjoining article, "On the Visual Images that Galaxies Create" lead us down the road toward an understanding of the formation of structure. [77]

If quantum entanglement and gravitational attraction are evaluated on the basis of the bonding message getting through correctly, they would score as certain - as 100 - 0. Chemical bonds likewise? Bonding which occurs at the level of living structures has a greater degree of uncertainty. Let us give examples: (We recognize that these examples all represent sequences of local action. The uncertainty lies in the initial input or 'choice')

The ethologist, Konrad Lorenz worked with geese. Baby geese (goslings) bond (imprint) with their mother, immediately after hatching from the egg, and follow her faithfully (for the most part.) Following mother increases likelihood of being fed and reduces likelihood of danger. How do the goslings know to follow the mother? Lorenz performed an experiment. He removed some goose eggs from the nest, and found, that when the mother was not around, that newly hatched goslings would bond to a bouncing ball or the heel of the experimenter. So, 'movement' is the message. The gosling emits a call and then imprints on the first thing that moves in the visual field. Movement in the visual field, triggers the 'on' switch, which releases, or 'selects', the pre-programmed bonding/following behavior. Since the mother is usually present, and is large, so that she would pretty much fill the field of vision, there is a high, but not certain, probability that the 'correct' message would be delivered. The communication channel is the sense of sight. Psychologists call this pre-programmed behavior an Innate Releasing Mechanism (IRM). (It is consistent with Edelman's description of 'value centers'.) [78]

In sheep, lambs are less mobile than goslings, and it is the ewe that receives the bonding message, based upon the smell of her infant. If the smell is foreign to her, that is, the lamb may have been handled by humans or otherwise contaminated, she will reject her offspring. As a child, it was my job, to bottle feed the 'orphan' lambs, collected every spring, on our farm and neighboring farms. There is a fairly high degree of risk of uncertainty in the smell of newborn lambs, especially in a human environment, and the correct message does not always get through. The communication channel is the sense of smell.

In humans, and other primates, bonding is the basis of social learning. Since human and other primate infants are not independently mobile upon birth, more time is permitted for bonding to occur. The psychologist, Harry Harlow, demonstrated that, in monkeys, infant bonding was based upon the sense of touch or contact. His famous experiment, where baby monkeys clung to the cloth 'mother', as opposed to the wire 'mother' with milk, demonstrated that the need for contact, was a more primary behavioral motivator, than the need for food. We explain this, partially, because the need for safety is constant and the need for food is periodic. The need for contact is also there to create the environment for social learning. Harlow also demonstrated that, absent the real mother, social learning fails to occur, and maternally deprived monkey infants are behaviorally dysfunctional. John Bowlby (1907-1990) and Rene Spitz (1887-1974) have recorded similar outcomes in human infants, who are circumstantially, not experimentally, similarly deprived. In human (especially in human) and other primate bonding, a relatively high degree of uncertainty exists, and there is a fairly high error rate in the message delivery. The communication channel is the sense of touch. [79] [80] [81]

There is another controversy that we address in the book. Judith Rich Harris, in her book, *The Nurture Assumption* (1998), denies the importance of early infant experience. She is, unfortunately, supported in this by her friend, the psychologist, Steven Pinker, who wrote a foreword for her book, and by the American Psychological Association, which gave her an award. Harris does a good job describing the influence of the youthful peer group on human development, but pre-adolescence/adolescence is a later stage in development. Harris to the contrary, the early childhood experience is extremely important. [82]

Competition and Emergence

At the close of his book, Uncertainty - Einstein, Heisenberg, Bohr and the Struggle for the Soul of Science (2007), David Lindley makes this statement:

We come to a paradox that Bohr would have loved: it's only through an initial, inexplicable act of quantum mechanical uncertainty that our universe came into being, setting off a chain of events that led to our appearance on the scene, wondering what original impetus led to our existence. [83]

We propose, that if we recognize, that the "inexplicable act of quantum mechanical uncertainty" repeats itself at various levels of structural complexity (the quantum jumps), through the process, which we refer to as 'emergence', we may come to a better understanding. We have come to recognize, that what 'emerges', is unpredictable behavior. Things behave differently, at different levels of structural complexity, yet, patterns of behavior can be observed across levels, such as; bonding, approach-avoid (attract-repel), ingest-eject (absorb-emit), dominance-submission (interference), create-destroy (not to mention such things as tunneling and pulsing.) It is "*the ceaseless rotary motion of the energy eigenvectors*, which appears to be tending toward, increasing structural complexity. This all sounds pretty metaphysical; yet, one way science proceeds, is by examining similarities and differences.

We conclude with Einstein, from *The Evolution of Physics, (1938)*

With the help of physical theories we try to find our way through the maze of observed facts, to order and understand the world of our sense impressions. We want the observed facts to follow logically from our concept of reality. Without the belief that it is possible to grasp the reality with our theoretical constructions, without the belief in the inner harmony of our world, there could be no science. This belief is and always will remain the fundamental motive for all scientific creation. Throughout all our efforts, in every dramatic struggle between old and new views, we recognize the eternal longing for understanding, the ever-firm belief in the harmony of our world, continually strengthened by the increasing obstacles to comprehension.

"*...the ever-firm belief in the harmony of our world*". What if the world is not harmonious, but competitive? The laws of thermodynamics, which Einstein endorsed, establish this fact. In the book, we discuss Einstein's oft repeated remark, that "God does not play dice with the Universe." Einstein believed that Maxwell's concept of field action would ultimately be able to explain all. He believed that our universe is determined and harmonious. If anyone could have made that paradigm work, it would have been Einstein. It appears that a different paradigm may be necessary. The paradigm we propose, substitutes competitive choice for determinism, and it substitutes emergence for reductionism. It does not abandon the concept of cause and effect. Quantum mechanics exemplifies this paradigm. [84, 85]

In a speech delivered in 1973, at the Symposium of the Smithsonian Institution and the National Academy of Sciences in Washington, D.C., Heisenberg observed that science is driven by tradition and traditional methods and concepts. He points out that particle physics requires the abandonment of the concept of fundamental elemental particles enunciated by the Greek philosopher, Democritus, (c. 470 - c.360 B.C. -disputed) and, he recommends, the adoption of the concept of fundamental symmetries, which is derived from the philosophy of Plato. Notwithstanding his suggestion to follow the symmetries of Plato, Heisenberg also stated, that it is the dynamics of matter, which it is important for us to understand. We propose consideration of the concepts of the pre-Socratic Greek philosopher, Heraclitus (Herakleitos of Ephesos c.540 - c. 480 B.C.) Richard Dawkins, in his most recent book, quotes the biologist, Ernst Mayer, to the effect that Plato, and his concept of ideal forms, may be a barrier to understanding evolution. Dawkins recommends Heraclitus. Heisenberg, while recommending the symmetry of Plato, points out in his 1958 Gifford Lectures, that, if we substitute energy for fire, in the philosophy of Heraclitus, his statements reflect, almost word for word, the modern (quantum?) views of physics. Heisenberg also states, that the concept of 'becoming' occupies the foremost place in the philosophy of Heraclitus. Heraclitus believed that the 'logos', or the universal formula, in accordance with which, all natural events occur, involves the connection of opposites. Changes in one direction are ultimately balanced by corresponding changes in another direction, so that, what is apparently 'tending apart' is actually being brought together, thus making this paradigm, ultimately, symmetrical. Heraclitus believed that it was within the ability of humankind, and was a responsibility of humankind, to understand those principles which, similarly, control both human nature and the environment. Heraclitus recognized the conservation principle, he intuited thermodynamic processes, and he anticipated the existence of particle/antiparticle. [86] [87] [88] [89]

Still are thy pleasant voices, thy nightingales awake;
For death, he taketh all away, but them he cannot take.
From the poem, *Heraclitus* by William Johnson Cory

Theoretical Applications

We can imagine floating along in the continuum of time and space. Going with the flow is very easy. However, the structure of General Relativity, provides no clue, as to how to solve the human problems of poverty, war, oppression (including suppression of creativity) and, what we refer to as, psychological damage. Karl Marx (1818 - 1883) also provided a theory of flow - the theory of the flow of history - which is still with us, and, which was intended to solve those problems. His theory failed in its experimental application. Our theory, which, in our book, we present in far more detail, and with much greater supportive evidence, is intended as an explanatory hypothesis, which, along with proposed solutions to human problems, is offered as a competitive choice to the theory of Marx and all that flows from Marx. Our theory has also had an experimental application that has had results superior to that of Marx.

Those who seek to oppress (establish their dominance) find that the concept of inevitability is useful to their cause. Einstein's theory of relativity, while correct in its physical application, is wrong in its philosophical and causative assumptions. It provides unwitting or, perhaps, willing support to Marx, since Einstein claimed to be a socialist. We find it necessary to challenge his philosophical assumptions.

The concept of relativity, establishes that the laws of physics are invariant as to coordinate systems. This invariance has been philosophically ignored, and the relativity aspect, construed to mean, that truth is whatever one wishes it to be. 'Enlightened' people have used this philosophical position of relativity to 'deconstruct' the human knowledge base accumulated over the centuries. They have taken the idea, that people, in their scientific thinking, are affected by their philosophical prejudices, and run with it. The fact that scientists and others are affected by their prejudices (world view) is an instance of Bohr's observation, of the measuring device affecting the outcome of the measurement. It is a reason, for the necessity to compare, many such measurements, in a complementary fashion, as Bohr advised. It is not a reason to totally discount, the information provided, which has now become almost institutionalized in the humanities and the social sciences (dead white males and all that). It is our impression, that Einstein, during his lifetime, did little or nothing to counter this variant thinking about his invariance. If our impression is correct, it might be due to what we call, 'competition avoidance'; that is, an unwillingness to confront the profound role competition plays in our universe. That unwillingness, which is shared by many, is related to the fact, that competition is scary and is upsetting to our safety needs. Einstein endured one of the scariest times in human history, and it is nice to be able to cling to "*the ever-firm belief in the harmony of our world*."

Marx dealt with competition, but he limited it to class competition. It is even nicer to be able to dump all thoughts of competition into one arena - class competition; assign it a cause - private property; and predict its ultimate, utter and complete demise. Experience has proved this to be disastrously wrong. Unfortunately, many refuse to accept the evidence. They prefer the fantasy. Our position is, that if we fail to understand the role that competition and emergence play in our world, it has the potential, like the virus, of destroying us. At the very least, the threat of the human need for dominance, coupled with the human need for predictability, exercised in a technologically united world, has the capacity to oppress and destroy all creativity, including the creation of the 'economic surplus', which is defined as the creation of need satisfiers surplus to basic survival needs. The competition between the individual and the group will be decided in the favor of the group. Many, who like this idea, and imagine that, due to their 'moral' and 'intellectual' superiority, they will be the ones to end up 'on top', may be in for a rude awakening. There is a difference between focusing on 'emergence' and sharing the plenty, and being focused upon competitive envy. Envy is a topic that gets considerable attention in our book. [90]

As social animals, we all have a survival need to "have more than others have and to be superior to them." This is because, those on the top of the heap, are more likely to survive during times of privation. We also have the capacity to sacrifice our life for others, or for our beliefs, or in despair. We are variously equipped by evolution, and, perhaps, ultimately by God. Our varied equipment is why choice is essential.

We all get that rosy 'endorphin' glow when we feel that we are being virtuous or superior. But, as Einstein and Heisenberg pointed out, we may be being deceived by our prejudices/world view. We all want to be on the side of the 'good' guys, or the 'angels'. We all want to be on the winning team. But, we may be simply following the Pied Piper, or Konrad Lorentz' bouncing ball, or simply salivating at the sound of a bell. Even sociopaths believe that they are the ones who truly understand the way things work, and that the rest of us are simply suckers. We tend to judge our beliefs by what others, in our peer group, think. We tend to contrast the superiority of our beliefs with what those 'other stupid guys' think. This is why Niels Bohr is important. Bohr recognized that, we are the measuring device, and that, it is difficult, if not impossible, to separate the measuring device from the information gathered. It is, therefore, necessary to compare, the information, in a complementary fashion. We have gathered information that is, in many ways, contrary to that gathered by Karl Marx. We offer it for comparative purposes, to help determine, which is truly the best way, to achieve the 'greatest good for the greatest number'.

References

[1] Albert Einstein, **Autobiographical Notes: A Centennial Edition**, Open Court Publishing Company, USA, **1992**, ISBN 0-8126-9179-2, p. 31.

[2] Arthur S. Eddington, **The Nature of the Physical World: The Gifford Lectures 1927**, The Macmillan Company, New York, USA, **1948**, Chapter IV, The Running Down of the Universe, p. 74

[3] Peter Atkins, **Four Laws That Drive the Universe**, Oxford University Press, Great Clarendon Street, Oxford OX2 6DP Great Britain, **2007**; ISBN 978-0-19-923236-9

[4] Christopher K. Mathews, K.E. van Holde, Kevin G. Ahern, **Biochemistry: Third Edition**, An Imprint of Addison Wesley Longman, Inc., 1301 Sansome Street, San Francisco, CA 94111, **2000**; ISBN 0-8053-3066-6 pp. 12-13.

[5] Charles Darwin, **The Origin of Species and The Descent of Man**, The Modern Library, Random House Inc. New York, USA.

[6] Francis Crick, **The Astonishing Hypothesis: The Scientific Search for the Soul**, Glossary, A Touchstone Book, Simon &Schuster,1994, Rockefeller Center, 1230 Avenue of the Americas, New York, NY 10020, **1995**; ISBN 0-684-80158-2, p. 273.

[7] Richard Dawkins, **The Selfish Gene**, Oxford University Press, Walton Street, Oxford, OX2 6DP, Great Britain, **1989**; ISBN 0-19-286092-5.

[8] Konrad Z. Lorenz, **The Foundations of Ethology: The Principal Ideas and Discoveries in Animal Behavior**, A Touchstone Book, Simon & Schuster, 1230 Avenue of the America's, New York, New York, USA 10020, **1981**; ISBN 0-671-44573-1.

[9] Abraham H. Maslow, **Motivation and Personality**, Harper & Brothers, 49 East 33rd Street, New York 16, New York, USA, **1954**; Library of Congress 54-10712.

[10] Ivan P. Pavlov, **Conditioned Reflexes: An Investigation of the Physiological Activity of the Cerebral Cortex,** Dover Publications, Inc., 180 Varick Street, New York 14, New York, USA, **1960**; Library of Congress 60-2546.

[11] Tina Hesman Saey, **Let There Be Light: New Technology Illuminates Neuronal Conversations in the Brain**, *Science News*, January 30, **2010**, p. 21.

[12] Gerald M. Edelman and Giulio Tononi, **A Universe of Consciousness: How Matter Becomes Imagination,** Basic Books, 10 East 53rd Street, New York, New York 10022-5299, USA, **2000**; ISBN 0-465-01377-5.

[13] Gerald M. Edelman, **Second Nature: Brain Science and Human Knowledge**, Yale University Press, New Haven & London, Connecticut, USA, **2006**, ISBN 13: 978-0-300-12039-4 p. 28.

[14] Francis Crick, **Neural Edelmanism**, Trends in Neuroscience 12, no. 7, July **1989**, p. 247.

[15] Jean Piaget, **Adaptation and Intelligence: Organic Selection and Phenocopy,** Hermann, Publishers in Arts and Science, Paris, France, **1980**; ISBN 2-7056-5852-1.

[16] Tina Hesman Saey, **Epic Genetics**, *Science News*, March 24, **2008**, pp. 15-19.

[17] Erwin Schrödinger, **What Is Life? The Physical Aspect of the Living Cell with Mind and Matter & Autobiographical Sketches**, Mind and Matter Chapter 2, Cambridge University Press, The Pitt Building, Trumpington Street, Cambridge CB2 IRP, Great Britain, **1992**; ISBN 0-521-42708 p. 111.

[18] Tom Siegfried, **A Beautiful Math: John Nash, Game Theory, and the Modern Quest for a Code of Nature,** Joseph Henry Press, 500 Fifth Street NW, Washington, DC 20001, USA, **2006**; ISBN 0-309-65928-0.

[19] L.C. Thomas, **Games, Theory and Applications**, Ellis Horwood Limited, Market Cross House, Cooper Street, Chichester, West Sussex, PO191EB, England, **1986**; ISBN 0-470-20741-8.

[20] Thomas Sowell, **A Conflict of Visions**, William Morrow and Company, Inc. 105 Madison Ave., New York, N.Y. 10016, USA, **1987**, ISBN 0-688-06912-6.

[21] Thomas Sowell, **Intellectuals and Society**, Basic Books, 387 Park Ave. South, New York, N.Y. 10016-8810, USA, **2009**, ISBN 978-0-465-01948-9.

[22] Celeste Biever, **A Voice for the Voiceless**, *New Scientist*, February 6-12, **2010** pp. 8-9.

[23] Gerald Edelman, Op Cite [12], p. 47.

[24] Francis Crick, Op Cite [6], p. 10.

[25] Sigmund Freud, **A General Introduction to Psychoanalysis**, Washington Square Press, Inc., University Press Division, 32 Washington Place, New York, New York, USA, 4th Printing **1962.**

[26] Francis Crick, **Of Molecules and Men,** Prometheus Books, 59 John Glenn Drive, Amherst, New York 14228-2197, USA, **2004**, ISBN 1-59102-185-5.

[27] Edith Hamilton and Huntington Cairns, Editors, **The Collected Dialogues of Plato**, Princeton University Press, Princeton, New Jersey, USA, 14th printing **1989**, ISBN 0-691-09718-6.

[28] Clara Mears Harlow, **From Learning to Love: The Selected Papers of H. F. Harlow**, Praeger Publishers, 521 Fifth Avenue, New York, New York 10175, USA, **1986**, ISBN 0-275-92224-3.

[29] Albert Schweitzer, **Paul and His Interpreters: A Critical History**, The Macmillan Company, New York, New York, USA, **1951.**

[30] Garry Wills, **What Paul Meant**, Penguin Group (USA) Inc., 375 Hudson Street, New York, New York 10014, USA, **2006**, ISBN-13: 978-0-670-03793-3.

[31] Cynthia Kolb Whitney, Book Reviews, **Galilean Electrodynamics**, Vol. 5, No. 3, May/June **1994**, p. 60.

[32] Murray Gell-Mann, **The Quark and the Jaguar**, W. H. Freeman and Company, New York, USA, **1994**, ISBN 0-7167-2581-9, pp. 155-156, 164-165, 212.

[33] Francis Crick, Op Cite [6], pp. 11-12

[34] Albert Einstein and Leopold Infeld, **The Evolution of Physics**, Simon & Schuster, Rockefeller Center, 1230 Avenue of the Americas, New York, New York 10020, USA, **1966**, ISBN 0-671-20156-5, III Field, Relativity, p.244

[35] Werner Heisenberg, **Physics and Philosophy**, 1958 Gifford Lectures, Harper Collins Publishers, 10 East 53rd St., New York, NY 10022, USA, **2007**, ISBN-10: 0-06-120919-8, Chapter IV, pp. 44-45

[36] Isaac Newton, **Opticks**, Dover Publications, Inc., 180 Varick Street, New York, New York 10014, **1979**, ISBN 0-486-60205-2, p 374

[37] Peter Graneau and Neal Graneau, **Newton versus Einstein: How Matter Interacts with Matter**, A Hearthstone Book, Carlton Press, Inc., New York, New York, USA, **1993**, ISBN 0-8062-4514-X

[38] Roger Penrose, with Abner Shimony, Nancy Cartwright and Stephen Hawking, **The Large, the Small and the Human Mind,** Cambridge University Press, The Edinburgh Building, Cambridge CB2 2RU, UK, **1997**, ISBN 0-521-56330-5, Chapter 2, "The Mysteries of Quantum Physics," Chapter 3, "Physics and the Mind," pp. 50-143

[39] Isaac Newton, Op Cite [36], Sir Isaac Newton's Advertisements, p cxxiii

[40] Albert Einstein, Op Cite [1] pp. 45-47

[41] Albert Einstein, **Relativity: The Special and The General Theory: A Popular Exposition**, Crown Publishers, Inc. One Park Avenue, New York, New York 10016, USA, **1961**, p. 48

[42] Arthur Eddington, Op Cite [2], pp. 1-162

[43] Werner Heisenberg, **Encounters with Einstein and Other Essays on People, Places and Particles**, Princeton University Press, 41 William Street, Princeton, New Jersey 08540, USA, **1989**, ISBN 0-691-02433-2, "What is an Elementary Particle, " pp. 72, 82

[44] Albert Einstein and Leopold Infeld O Cite [34], pp186-187

[45] Albert Einstein and Leopold Infeld, Op Cite [34], pp. 125 - 245

[46] Roger Penrose, **The Road to Reality: A Complete Guide to the Laws of the Universe**, Alfred A. Knopf, a division of Random House, Inc., New York, New York, USA, **2005**, ISBN 0-679-45443-8, pp. 706-707

[47] Martijn van Calmthout, **Gravity's Origin Falling Into Place**, New Scientist, January 23-29, **2010**, pp. 6-7

[48] Morton F. Spears, **An Electrostatic Solution for the Gravity Force and the Value of G**, *Galilean Electrodynamics*, Vol. 21, No. 2, March/April **2010**, pp.. 23-32

[49] Werner Heisenberg, Op Cite [35], Chapter VI, pp. 72-75

[50] Albert Einstein and Leopold Infeld, Op Cite [34] III Field, Relativity, p 191-199

[51] Werner Heisenberg, Op Cite [43], "Cosmic Radiation and Fundamental Problems in Physics," p 60

[52] Werner Heisenberg, Op Cite [48], Chapter IV, pp. 40-41

[53] Peter F. Erickson, **Absolute Space, Absolute Time, & Absolute Motion**, Xlibris Corporation, www.Xlibris.com, United States of America, ISBN 978-1-5992-6117-1

[54] Peter F. Erickson, **The Nature of Time, Proceedings of the Natural Philosophy Alliance**, Vol 5, No. 1, **2008**, p. 54

[55] Stanley L. Jaki, **The Only Chaos and Other Essays**, University Press of America, Inc., 4720 Boston Way, Lanham, Maryland 20706, USA, **1990**, ISBN 0-8191-7896-9, The Cosmic Myth of Chance, pp. 17-30

[56] Francis Crick, Op Cite [6] pp. 265-268

[57] Erwin Schrödinger, Op Cite, [17], Epilogue to **What is Life**, pp. 86-90

[58] Gerald Edelman, Op Cite [13], pp. 94, 99, 100

[59] Murray Gell-Mann, Op Cite [32], pp. 156-158

[60] Arthur Eddington, Op Cite [2], Chapter XIV, **Causation**, pp. 293-315

[61] Roger Penrose, Op Cite [38]

[62] Niels Bohr, **Essays 1958-1962 On Atomic Physics and Human Knowledge**, Vintage Books, A Division of Random House, New York, USA, **1963**, Quantum Physics and Philosophy: Causality and Complementarity, pp. 1-7

[63] Roger Penrose, Op Cite [46], p 615

[64] Werner Heisenberg, Op Cite [48], Chapter V. p 55

[65] Wolfgang Smith, **The Quantum Enigma: Finding the Hidden Key**, Sherwood Sugden & Company, Publishers, 315 Fifth Street, Peru, Illinois 61354, USA, **1995**, ISBN 0-89385-042-X, p. 131

[66] Claude E. Shannon and Warren Weaver, **The Mathematical Theory of Communication**, The University of Illinois Press, Urbana, Illinois, USA, **1964**

[67] Albert Einstein and Leopold Infeld, Op Cite [34], III Field, Relativity, pp. 192 - 199

[68] Roger Penrose, Op Cite [38], The Objections of an Unashamed Reductionist - Stephen Hawking, pp. 169-172

[69] Stephen Hawking with Leonard Mlodinow, **A Briefer History of Time**, Bantam Dell, A Division of Random House, Inc., New York, New York, USA, **2005**, ISBN 0-553-80436-7

[70] Roger Penrose, Op Cite [38]

[71] Gerald Edelman, Op Cite [12], pp. 27, 34, 47-50, 51-61

[72] Francis Crick, Op Cite [26], pp.72-75

[73] Werner Heisenberg, Op Cite [43], "What Is An Elementary Particle", p 73

[74] Ernest M. Henley and Alejandro Garcia, **Subatomic Physics: Third Edition**, World Scientific Publishing Co., Pte. Ltd., USA office: 27 Warren Street, Suite 401-402, Hackensack, New Jersey 07601, USA, **2007**, ISBN-13 978-981-270-056-8, pp. 79-128, 421, 425, 435,455

[75] Mathews, van Holde and Ahern, Op Cite [4] p 65

[76] Henley & Garcia, Op Cite [73] p 426

[77] Cynthia K. Whitney, **On the Visual Images that Atoms Create** and **On the Visual Images that Galaxies Create**, *Proceedings of the Natural Philosophy Alliance*, Vol. 4, No. 2, May **2007**. pp. 284-295

[78] Konrad Lorenz, Op Cite [8], pp. 272-276

[79] Harry Harlow, Op Cite [28], pp. 101-133, 281-304

[80] John Bowlby, **Maternal Care And Mental Health**, World Health Organization, Palais Des Nations, Geneva, Switzerland, **1952**

[81] Rene A. Spitz, **The First Year of Life**, International Universities Press, Inc., New York, New York, USA, **1965**, Library of Congress Catalog Number 65-18382

[82] Judith Rich Harris, **The Nurture Assumption: Why Children Turn Out The Way They Do**, Touchstone, Rockefeller Center, 1230 Avenue of the Americas, New York, New York 10020, USA, **1999**, ISBN 0-684-85707-3

[83] David Lindley, **Uncertainty: Einstein, Heisenberg, Bohr, And The Struggle For The Soul Of Science**, The Doubleday Broadway Publishing Group, www.doubleday.com, New York, USA, **2007**, ISBN 978-0-385-51506-1, p. 219

[84] Albert Einstein and Leopold Infeld, Op Cite [34], IV Quanta, p 296

[85] Peter Marquardt, Paul Wesley and George Galeczki, "**It Ain't Necessarily So": Nature's Little Surprises and How to Accept Them: The John E. Chappell Memorial Lecture, Proceedings of the Natural Philosophy Alliance**, Vol 4, No. 1, **2007**, p. 129 (To this I owe my "What if" statements.)

[86] Werner Heisenberg, Op Cite [43], "Tradition in Science", p 17, "What is an Elementary Particle," pp. 71-88

[87] John Burnet, **Early Greek Philosophy**, Meridian Books Library Edition, New York, New York, USA, **1957**, Library of Congress catalog number: 57-10842, pp. 130-168

[88] Richard Dawkins, **The Greatest Show On Earth**, Free Press, Simon & Schuster, Inc., 1230 Avenue of the Americas, New York, NY 10020, USA, **2009**, ISBN 978-1-4165-9478-9

[89] Werner Heisenberg, Op Cite [48], Chapter IV, pp. 36-37, 46-49

[90] Helmut Schoeck, **Envy: A Theory of Social Behavior**, Harcourt, Brace & World, Inc., New York, NY, USA, English Translation **1969**, Library of Congress # 69-14842. Originally published in German under the title, **Der Neid**