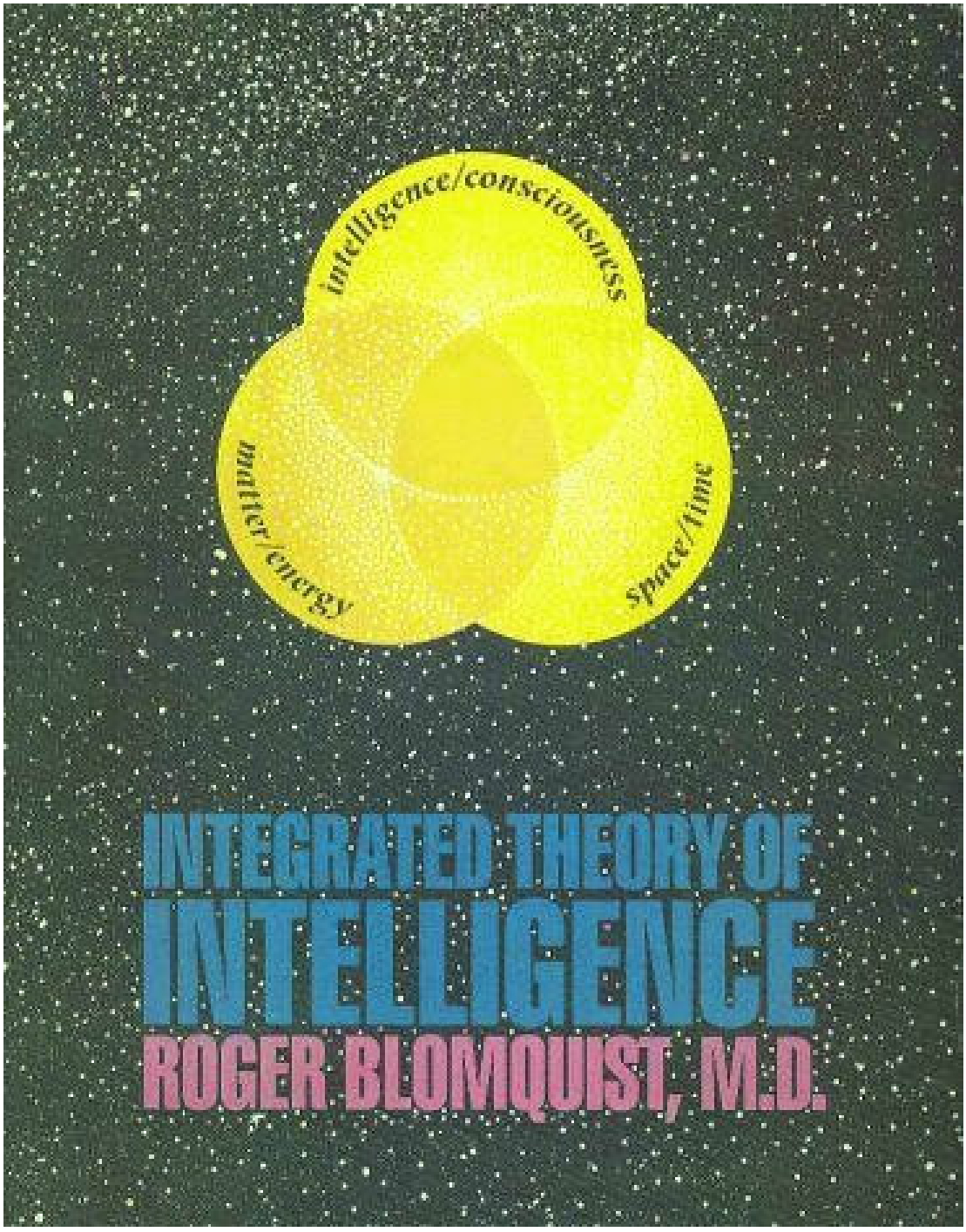

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About This Ebook

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2. This Ebook has been created for a couple of reasons. The first reason is to share the new theory contained in Dr. Blomquist's book "Integrated Theory of Intelligence". With this in mind, Dr. Blomquist and the publisher have made this information freely available to anyone who would like to read it. The theory describes the interrelationship of Intelligence and Consciousness with matter-energy and space-time. These are postulated to represent the properties of a solitary universal basic substance that comprises all of existence within our universe. The "Integrated Theory of Intelligence" should, therefore, be considered as a "Theory of Everything". This brings us neatly to the second reason this web site is here, and that is to encourage discussion and the exchange of ideas contained in this theory. Linked to the table of contents is a section named "Ask Questions/Comments". The hope is that, after reading this book, you will take advantage of that link, and continue the dialog that has been initiated, sharing your ideas and asking questions.

3. Many people, as they entered the web site, entered through a page that contained one of seven discussions. These discussions are provided immediately after the introduction. For those

individuals who have interest in exploring the Integrated Theory of Intelligence in the context of a theory of everything, it would be quite helpful to read both the introduction and the seven discussions, as the information contained within is considered to be very important toward arriving at a complete understanding of the theory presented. Reading the seven discussions can be accomplished at any time before, during, or after reading the book. It is recommended that you begin your reading with the introduction.

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10. Dr. Blomquist is in the process of creating a list of books that are good suggestions for further reading. It is a work in progress, but already has six topics that give new evidence of support for his theory. This page is much more than just a list of books. Dr. Blomquist is listing different topics of evidence, giving an explanation of what is important in each source and how it relates to the "Integrated Theory of Intelligence". He then lists the sources in bibliographic format at the end of each topic. This is especially exciting, because there is a lot of new evidence supporting his theory.

11. Available for purchase are paperback copies of this book, and Dr. Blomquist's Jazz CD. 100% of the purchase price of each of these items is tax deductible, as the full purchase price will be donated to New Horizons Crisis Center. A tax receipt will accompany your order. For more information on either of these items you may click on this Purchase Book link or this Purchase Jazz Album link. The New Horizons Crisis Center is a non-profit organization providing shelter for abused women who are attempting to free themselves from a life of domestic violence. Shelter is provided for abused women along with their children with the service area covering five counties within south central Utah. It exists through grants and private donations. The New Horizons Crisis Center's web site may be accessed through the link www.newhorizonscrisiscenter.com.

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15. This ebook is rather long with numerous graphics. In order to keep this under control, the sections following chapter 23 (ie. About the Author, and Suggested Reading) have been shortened. There is more information in these sections on the web site, http://www.supraconsciousnessnetwork.org/Home.htm. For instance, on our website, you can listen to some samples of Dr. Blomquist's Jazz Album, read the album insert, and read "About the Author".

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Introduction

The brief discussion below presents the basic premise of the book "Integrated Theory of Intelligence", which might be categorized as an "ultimate theory of everything" that describes the interrelationship of Intelligence and Consciousness with matter-energy and space-time. Intelligence-consciousness, matter-energy, and space-time are postulated to represent the properties of a solitary universal basic substance that comprises all of existence within our universe. Courtesy of the publisher and the author this book is available in its entirety on the web site and in other download formats free of charge.

Because of their importance, the “Introduction” and “Keyword Discussions” occur first in this ebook. For those individuals who have interest in exploring the Integrated Theory of Intelligence in the context of a theory of everything it would be quite helpful to read both this introduction and the keyword discussions, as the information contained within is considered to be very important toward arriving at a complete understanding of the theory presented. Reading the seven discussions can be accomplished at any time before, during, or after reading the book.

Most scientific theories describing the fundamental nature of the universe treat the existence of life--of intelligence--as an evolutionary afterthought or "lucky accident" which somehow occurred by mere chance. "Integrated Theory of Intelligence" rejects this view as fundamentally lacking. In this pioneering effort, intelligence-consciousness is proposed as an intrinsic aspect of existence just as fundamental as the known attributes of matter-energy and space-time, forming with them an interdependent process of ongoing creation that has resulted in our present universe.

Working from an original set of axioms defining the basic properties exhibited by intelligence, the reader is taken on a thought-provoking tour, which integrates into the book's proposed theoretical framework the latest findings from a host of scientific disciplines. Interwoven with the text are insights from such fields as biochemistry, neurophysiology, physics, cosmology, biology, genetics, and humanistic psychology, among others. Both panoramic and detailed, this look at the accumulating evidence posits the existence of intelligence as an unavoidable force in the operation of all phenomena, ultimately giving rise to the evolution of life and consciousness.

Written at a level that both lay readers and scientists not yet acquainted with these specialized fields can understand and absorb, this new view should fascinate anyone who is at all interested in intelligence and consciousness and how they have developed.

Rigorous yet balanced in its approach, "Integrated Theory of Intelligence" will challenge theorists and mystics alike to rethink how they look at the universe, mind, consciousness, the brain, and ultimately life itself.

In the book entitled the "Integrated Theory of Intelligence" the premise is developed that all facets of our existence are strongly interrelated and interdependent. Many centuries ago it was postulated that all physical existence was comprised of earth, water, fire and air. The current theory reframes these basic "ingredients" in the present-day language of matter-energy, space-time, and intelligence-consciousness. Others may choose to list a different set of ingredients based upon their interpretation of reality; but no matter how our analytical-reductionist mind may divide existence into discrete entities, someday it will nevertheless be established that all objects within our perceived reality are interrelated and interdependent. This in fact is the present-day goal of physicists pursuing what has come to be known as the "Theory of Everything."

The Integrated Theory of Intelligence predicts that not only are the basic ingredients interrelated - no matter how we define them - but that someday it will be proven there is actually only one basic substance within the universe, and that the ingredients as we presently perceive them would be more usefully viewed as evolved properties of that one substance. This is somewhat analogous to the way many physicists now believe that there was only one superforce at the moment of universal creation, which soon thereafter divided into the four (or more) physical forces.

The theory postulates that as matter-energy is continually subdivided within the subatomic realm into smaller and smaller components, it eventually dissolves, or reduces to, the background of space to become part of it. It is suggested here, therefore, that matter is actually a very highly condensed form of space. If so, this would account for the "virtual particles" which seem to be continuously popping into and out of existence everywhere throughout space. If this is true, it would provide us with the link between matter-energy and space-time. Einstein's General Theory of Relativity also makes the prediction that matter-energy is interrelated to space-time.

It will be considerably more difficult to prove that intelligence-consciousness forms a common bond with matter-energy and space-time for the following reasons. Most scientists are searching for an explanation of our physical existence that incorporates only matter-energy and space-time and many of them also believe that intelligence-consciousness is an epiphenomenon that occurred by chance, playing no role in the direction of the evolutionary process. This bias will slow the recognition of the interdependence of these properties.

The evidence to date is insufficient to prove that the universe is comprised of only one basic substance as here suggested. Nevertheless, in the interest of sketching out the ramifications of the theory in full, it

should be stated here that the theory does lead to such an eventual prediction.

The nature of consciousness has yet to be defined in modern terms even though a great deal of time and effort has been devoted to this endeavor, particularly over the last several decades. The question as to its origin and significance dates back to antiquity but only recently have we gained enough understanding as to its place within the usual scheme of things, to begin to unravel this mystery. It is my current belief that we must begin with one of two choices. It would appear that consciousness must either be a primary property of the universe being present at the beginning or developed later as an epiphenomenon. If one were to poll most scientists I would guess that the majority would side with those individuals who believe consciousness to be an epiphenomenon. Most research scientists who have devoted themselves to the study of the mind-brain believe consciousness to be an epiphenomenon of the electrochemical events occurring within the brain. There is simply no question that consciousness is heavily influenced by these electrochemical events but it is also most doubtful that they are the cause of consciousness.

For many years I remained an agnostic relative to whether consciousness represents a primary or secondary phenomenon since I could not find compelling reasons to choose either viewpoint over the other. I now believe that there is enough information, much of which is scientifically based, to allow for a clear choice. As a matter of fact I would even suggest that the evidence is overwhelming and those whose persist in choosing the other alternative are selectively ignoring the preponderance of information available.

When the Integrated Theory of Intelligence was first developed in 1984 there was less scientific evidence to support the conclusions offered in the text. Since then there has been considerable progress and there is more scientific evidence accumulating to support the theory. For those

that are interested, a reading list of books can be accessed through this web page, each with a short synopsis summarizing how the information within the book gives additional support to the concepts presented in the "Integrated Theory of Intelligence".

The hypothesis being presented is based upon the premise that consciousness is a primary property of the universe. Since most scientists are not willing to embrace this concept, the worldview, which ultimately follows, is still subject to question. It is my postulate that by accepting the premise that consciousness is a primary property, a more consistent picture emerges that best describes our reality.

There is now very strong evidence, which suggests that our universe began in a manner best defined by the "Big Bang" Theory. Even though I have always been somewhat offended by a comic book name for what is arguably the greatest single event in the history of the universe, it would appear that the most essential parts of the theory are approximately correct.

The big bang theory postulates that the universe sprang forth from a singularity where matter-energy-space-time were compressed into an extraordinarily small volume prior to the moment of creation. Just prior to the expansion process there would have been an infinitely high or near infinitely high focus of energy without any formed matter in an infinitely or near infinitely small volume of space without the existence of time. This energy focus would have been homogeneous and undifferentiated without any recognizable form. One of the most important questions ever posed is whether intelligence-consciousness existed at the moment of creation or became manifest at some later date as a chance epiphenomenon. To explain all phenomenon that we observe I would have to conclude that intelligence-consciousness existed at the moment of creation and has been an active participant ever since. Whether the universe began as a singularity or not is currently open to debate. For example superstring theory does not require a singularity

with infinite energy being compressed into an infinitely small volume of space. In superstring theory the expansion began with nearly infinite energy within a very small volume of space.

It would seem probable that at the moment of creation there was one uniform homogeneous basic substance without any form which best could be described as an almost infinitely high concentration of energy with the property of intelligence-consciousness and that following the big bang this energy began to rapidly dissipate into an increasingly larger volume of space being influenced by this property of intelligence-consciousness. This extremely high energy could not be manipulated into any significant form until it had dissipated into a sufficiently large volume of space thus allowing for a tremendous decrease in energy density. The higher the energy density the greater the chaos and the less order possible. Increasing order gradually appeared only as the energy density decreased. Spatial expansion was absolutely essential to allow for the evolution of higher order systems. There is a direct mathematical relationship between a decreasing energy density and the evolution of increasingly higher order systems. We will later discuss how increasing heat entropy, as defined by the second law of thermodynamics, is an essential part of the evolution to increasingly higher order systems containing increasingly greater amounts of information. This relationship is interrelated and both are dependent upon each other. We began with a universe that was infinitely hot with maximum chaos devoid of order, which has evolved, to a state where chaos has drastically decreased and order dramatically increased. This has occurred exponentially over time and will continue to do so as long as the universe is in state of expansion. The rate of evolution to higher order systems is directly dependent upon the rate of universal expansion. The greater the volume of the universe the less the energy density and the more that the chaos, which is a function of energy out of control, can be manipulated into order by the property of intelligence-consciousness.

A single superforce was present at the moment of creation as another property of the uniform, homogeneous, undifferentiated basic substance, which differentiated into the four physical forces which we currently recognize.

At the moment of creation, intelligence-consciousness was totally unified with matter-energy without differentiation but with the potential to be divided up and fractionated into many forms, only a few of which we are currently aware. Our current paradigm would lead most to conclude that intelligence-consciousness is limited to humans or perhaps other human-like creatures on other planets in other galaxies. The theory being presented would allow for a great many other material and non-material forms that possess intelligence-consciousness, including systems that are both living and non-living. Intelligence-consciousness permeated the early universe and would have taken on any form that currently existed at any time throughout the evolutionary process. This is how intelligence-consciousness was able to influence this process resulting in a highly organized universe balanced between order and chaos. It began in a state of maximum chaos and minimal order and has evolved to greater and greater levels of order with lesser and lesser degrees of chaos, and has done so exponentially over time.

If one has interest in pursuing the concepts outlined above, then read the text "Integrated Theory of Intelligence", which can be accessed in its entirety in this download. It will be noted by examining the Table of Contents that the information contained within the book addresses a wide variety of subjects pertaining to consciousness and intelligence including such things as the evolution of intelligence-consciousness as well as altered states of consciousness.

A hard copy of the book can be purchased through New Horizons Crisis Center, which is a non-profit organization providing shelter for abused women who are attempting to free themselves from a life of domestic violence. Shelter is provided for abused women along with their children

with the service area covering five counties within south central Utah. It exists through grants and private donations.

The hard copy of this book can, therefore, be obtained by sending a check for $25 (U.S. Dollars) Plus $3 for shipping and handling ($5 shipping and handling for orders originating from outside the United States) to New Horizons Crisis Center. Please make checks payable to "New Horizons Crisis Center". Their address is 145 East First North, Richfield, Utah (84701).

Your $28 check is tax-deductible as the entire donation goes directly to New Horizons Crisis Center with all production and printing costs having already been paid for through other private sources.

To learn more about New Horizons Crisis Center one can access their Web page with the URL, http://www.newhorizonscrisiscenter.com.

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Seven Discussions

If you are interested in a complete understanding of the "Integrated Theory of Intelligence" as a theory of everything it would be quite helpful to read both the introduction and all seven discussions. Hopefully you have already read the Introduction above; it is recommended that you begin your reading with the introduction. Reading the seven discussions can be accomplished at any time before, during, or after reading the book. The discussions, in the order they appear in this book, are as follows:

1. Matter-Energy
2. Space-Time
3. Universal Information Storage
4. Peak Experience/Abraham Maslow
5. Theory of Everything
6. Creative Force
7. Cosmic Consciousness

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Matter-Energy Discussion

Outlines the relationship of matter-energy, space-time and intelligence-consciousness as discussed in book entitled "Integrated Theory of Intelligence" which is one approach to a "Theory of Everything".

There is now a rather large variety of subatomic particles which have been experimentally verified. They differ from each other in certain ways best defined by their mass, charge, spin and energy equivalence. They collectively constitute the matter- energy spectrum. These subatomic particles were initially believed to represent the smallest solid objects in existence. They are now known to not be solid but rather highly concentrated foci of intense energy, which in some cases are stable, and in others are not stable. Superstring theory would suggest that the basic atomic particles are actually one-dimensional strings. This will be discussed later.

Every particle has a mass, which is roughly the same as weight, however mass is dependant upon both its energy and velocity. For instance an object becomes heavier when it is in rapid motion relative to when it is at rest. Mass has an energy equivalent as defined by Einstein's "$E=mc^2$". This indicates that a particle can be totally converted into energy and gives the exact amount of energy expected when this occurs.

Some but not all particles have an electric charge and are always in fixed multiples of a fundamental unit usually either a positive or negative one. Protons and positrons both have a unit charge of + 1 even though the proton is two thousand times more massive than the positron. An electron has a charge of -1 and the same mass as a positron.

Particles also act as if they have a designated spin that comes in different multiple units. They have been divided into two distinct classes of bosons or fermions depending upon their spin. Those with a spin 0, 1 or 2 are called bosons and those with half-integral spin of 1/2 or 3/2 are called fermions.

Particles are also grouped into one of two categories depending upon which force they couple to. Particles that couple to the strong force are called hadrons and those that couple to the weak force are called leptons.

There are literally hundreds of hadrons which have been identified. The most common types are protons and neutrons however many others exist as composites of smaller objects. Not only do they couple to the strong force as indicated above but also to the weak force and gravity. All hadrons are comprised of more fundamental smaller particles called quarks or antiquarks. It requires three quarks of various types to make a proton or neutron. Other particle types that are heavier than electrons but lighter than protons are called mesons of which there are many. They are made of quark-antiquark pairs and have a very short life expectancy (half-life).

Leptons are elementary point-like objects which only couple to the weak force and seem to be oblivious to both the strong force and gravity. The electron is the best-known lepton and has an electric charge of -1. The neutrino is also a lepton but carries no charge. Since neutrinos have no charge and don't couple to either the strong force or gravity they pass right through matter easily being almost completely oblivious to its presence. Neutrinos are by far the most common particle in the universe outnumbering electrons and protons by a thousand million to one. The universe is actually a sea of neutrinos punctuated rarely by atoms of any kind.

There are other types of leptons including the muon and tauon. The muon is responsible for much of the background cosmic radiation. It is larger than an electron yet has the same charge and spin. It has a very short half-life decaying into an electron and two neutrinos in about two-

millionths of a second. The tauon has a mass 3500 times greater than an electron. It has a negative charge and behaves much like an electron or muon.

Photons are particle and wavelike entities that travel only at the speed of light making up the electromagnetic spectrum and depending upon their energy level can appear as light waves, gamma or x-rays, ultraviolet or infrared light or radio waves. They are regarded as "real" when observed in this manner or "virtual" when they act as messenger photons between interacting particles such as electrons whenever an energy exchange is taking place.

Gravitons are postulated messenger particles somewhat analogous to photons. Whenever two particles exert a gravitational influence upon each other, gravitons are exchanged between them. Both gravitons and photons travel exclusively at the speed of light however there the resemblance ends. Photons carry only one unit of spin while gravitons carry two. The spin determines the direction of the force. With gravitons the direction of force is always attraction whereas photons can mediate either an attraction or a repulsion force.

Gluons are messenger particles analogous to photons that also have zero charge and zero mass and are responsible for "gluing" quarks together within the nucleus of an atom as they commute between them.

Messenger particles, which are responsible for the weak force, are different from any of the other messenger particles that result in all the other known forces. They are Wand Z particles both of which have some mass 85 and 95 respectively. The W messenger particle is also different from all of the others in that it can have either a positive or negative charge of 1. All other messenger particles which communicate a force have 0 charge.

The details which have been given for the various forces and particles reflects a very simplistic overview which is only a small sampling of what the physicist deals with however is presented to the general reader

as an approximation of our physical reality. It is sufficient to allow one to formulate a visual image in one's mind's eye as to what the basic building blocks look like as well as the forces that bind them together. Superstring theory is redefining our image of atomic and subatomic particles and the forces that exist between them. One must remember however that our best descriptions of the subatomic realm represent mathematical metaphors at best. The descriptions are only approximations of our basic underlying reality. The message that I would hope to convey is that the basic units of our existence such as atomic and subatomic particles can be mathematically defined and described to a level of very high precision and that there are known forces which allow us to predict the behavior of these particles also with high precision. Tremendous uncertainty exists when predicting the behavior of anyone individual particle-like object however when viewed collectively much can be stated about the anticipated outcome. This is another example of the wonderful balance between order and chaos that permeates our universe. Physicists believe that all forces exist to enable nature to maintain a set of abstract symmetries in the world. It is not terribly important that the general reader remember what each particle or force does. What is important is to appreciate the high level of precision that the physicist has been able to describe and define the basic physical ingredients of the universe of which each of us is a part even if they are only metaphoric approximations.

Energy

Energy represents the capacity for doing work but also is much more since in essence it comprises all of our material existence. The atoms and molecules, which collectively are the building blocks for all seemingly solid objects that we observe throughout the universe, in reality, are made up of this non-solid substance. The atomic and subatomic particles are actually intensely concentrated foci of energy in a quantum field. Particles appear to exist where quantum fields interact.

A field is spread out over a much larger area than a particle and completely fills a given space. When two fields interact they do so instantaneously. Wherever these local interactions occur, particles are perceived to be present. The continuous creation and annihilation of subatomic particles is the result of the continual interaction of different fields resulting in focal concentrations of intense energy at points in space. All particles can be transmuted into other particles. The faster the so-called particle moves, the higher its energy level. When a particle is viewed as a wave then its frequency is directly related to its energy level. The higher the frequency, the greater the energy level. The wavelength is inversely proportional to its energy level. The shorter the wavelength the greater the energy.

Energy is defined as the capacity for doing work. It can take a great variety of forms including energy of heat, energy of motion, gravitational energy, chemical energy, electrical energy, etc. Electrical and chemical energy can be transformed into heat energy and used to perform work. The law of conservation of mass-energy indicates that whenever energy is transformed from one kind to another there is never any energy loss. The same concept applies when matter is converted into energy or vice versa. This law says that the total amount of mass-energy within the universe has been and will always be the same. Energy can be converted into mass and mass converted into energy but the total amount of mass-energy does not change.

When the appropriate amount of energy is available then particles can form from the energy. One good example is what is referred to as pair production. Energy within a field is transmuted into an electron and positron. The positron usually is quickly annihilated when it collides with another electron and the newly created matter is transformed back into energy.

Photons, which are both wave-like and particle-like objects, carry energy, the level of which is directly related to their frequency. They comprise the electromagnetic spectrum and can exist as radio waves,

infrared waves, light waves, ultraviolet waves, X rays and gamma rays. All of the above travel at the speed of light. Their energy levels are relatively low in the radio wave part of the spectrum and continuously increase up to the gamma ray region. Each photon carries a discrete amount of energy in specific quantities referred to as quanta.

A particle's mass is usually given as its energy equivalent. An electron volt is a unit of energy yet it is used to express the mass of a particle. To create an electron from energy requires .51 million electron volts. When pair production occurs with the creation of both an electron and a positron then two times .51 mev or 1.02 mev is required. Any particle has both a rest mass which is the equivalent of its energy of “being” and an energy of , “motion” (kinetic) energy. The sum of these two energies is the equivalent of the particle’s total mass.

Whenever a single particle spontaneously disintegrates it always decays into lighter particles. The difference between the mass of the original particles and the total mass of the new particles is converted into kinetic energy of the new particles that carry it away. If colliding particles such as two protons interact to form new particles, which have a combined mass greater than the original, then kinetic energy of the projectile proton was absorbed into the creation of the particles. It is absolutely essential that the total combined mass and energy, which involves interacting particles that mutate from one kind to another, remain identically the same following the event. The new particles will each have a different mass and energy than the original ones but the combined mass and energy will be the same. Focal concentrations of energy create the illusion of solid subatomic particles "mass". Mass is energy.

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Space-Time Discussion

How "Superstring Theory" relates matter-energy and space-time to intelligence consciousness as outlined in the book entitled "Integrated Theory of Intelligence" which is one approach to a "Theory of Everything".

There is no such thing as a pure vacuum in space. Even the most tiny volume of space imaginable contains at least a thin continuous film of energy although in near vacuum situations it will be extremely rarified. The same concept also applies to intelligence-consciousness, which occupies all of space although in some locations may be extremely rarified. This is the leftover effect from the big bang when at the very beginning there was one basic substance and one unified force that has evolved into our current universe which is still comprised of one basic fabric manifested as matter-energy-intelligence-consciousness in space-time with several specified forces.

Matter (atomic particles) is stabilized foci of energy, which is concentrated into very small volumes of space but without form. Atomic particles such as electrons can spontaneously form within space and then dissolve back into space being annihilated by anti electrons (positrons). Protons are extraordinarily stable but would have formed in much the same way as electrons. Energy is not separate from space which means matter isn't either, as atomic particles can precipitate out of space much like a cloud can spontaneously form out of pure blue sky. Once formed it may last billions of years like a proton or disappear within microseconds like a muon. The water vapor within the atmosphere concentrates together to form a cloud and then dissipates back into the atmosphere. The cloud like the electron has no form or defined boundary. The electron like the cloud has no outer shell. It is continuous with space and is indivisible from space. It again should be emphasized

that there is one basic fabric that makes up the universe, which is continuous and manifests the seemingly separate properties of matter-energy-intel1igence-consciousness-space-time.

Depending upon which interrelated properties of the basic fabric that one attempts to define the distinctions are only arbitrary and illusionary. We see matter as separate from energy and space as well as from intelligence-consciousness because our measuring devices are designed that way. We have an analog universe that we have artificially attempted to divide into discrete packets for observation and analysis. Since the universe is one complete total undivided entity all attempts to quantize it will only allow for approximations. Quantum field theory has achieved a predictable accuracy for atomic events to better than eleven significant figures. General relativity has a tested accuracy, which is even better. It has been proven to be correct to one part in 10^{14}. Other mathematical formulations in the future may achieve an accuracy that is even greater than this, however they will still remain only approximations. Infinitely accurate physical descriptions of the universe will always remain impossible. One would also reach this conclusion based upon the science of chaos. This also leads to the prediction made by this theory that no two points in space can be exactly alike. No two points in space have the same future or the same past. The difference between two very similar points may not be measurable because they are so nearly identical but it is still the conclusion that there are no two points in space, no matter how small the volume being examined, that are exactly alike. Any point in space is also in a state of continual flux where its properties are undergoing change from one moment to the next.

There likely is an infinite space, which stretches well beyond the limits of the space associated with our own universe. Its properties may be different in some ways. There may be multiple universes which surround our own in various stages of contraction and expansion. If so it would seem probable that they would share a common physics.

The composition of space within our own universe or any other changes over time. It goes through an evolutionary process allowed for by the expansion of space resulting in the continuously decreasing energy density. As the latter occurs this results in decreasing chaos and increasing order. There will be a continuation of the creation of higher order systems over time as space continues to expand.

Intelligence-consciousness is also a previously unrecognized property of space and is present in varying concentrations throughout all of the universe. In some regions it is densely concentrated and in others is quite rarified. Our own earth would appear to be a focus in space that has a heavy concentration of intelligence-consciousness. There is currently less known about its distribution throughout space than matter-energy. This will remain a challenge to science for an extended period of time. Those scientists who have the belief that virtually all that there is to know about our reality has already been defined in physical terms delude themselves.

Space as it exists in our universe began as a near infinitely small volume as relates to its eventual ultimate size which will not be achieved for at least billions of years into the future. It is one of six identified properties of a universal basic substance. The consistency of space has been and will continue to change from moment to moment. The space of the early universe was very much different in its consistency than what we observe today. The basic ingredients were the same but the way in which they manifested themselves would have been considerably different because of their relatively higher concentrations per unit volume. The physics that describes our current universe would probably apply to the past or future universe as it continuously evolves but it can't be certain that the numerical values of the universal mathematical constants would necessarily remain unchanged.

One interesting prediction that this theory would suggest, as space continues to expand, is that the rate of the aging process will gradually slow which would also apply to the rate that entropy occurs within any

system. Space as we are coming to understand is a very dynamic and interesting property of the universal basic fabric and at the most elementary level is continuous and undivided from matter-energy and intelligence-consciousness.

Time

Time is one of the six properties of the basic fabric of the universe. For time to exist requires the presence of consciousness or awareness. Without consciousness this dimension of physical reality would be reduced to a measure of distance or the measure of any change of a system. Time began with the big bang and has moved forward continuously ever since and will continue to do so hereafter. Time for us could theoretically end if our universe is closed which would someday result in a big crunch with the universe collapsing back upon itself.

Time prior to relativity theory was regarded as absolute however it is now known that this is incorrect. Time appears constant and unchanging within any isolated frame of reference system but is relative and could be measured differently by an observer outside this isolated frame of reference system looking inward. It has now been well documented that even though an individual within an isolated system moving forward at a very rapid velocity will not detect any time difference, an outside observer looking inward will detect a slowing of time that becomes quite dramatic as the speed of light is approached. General relativity also predicts that time will run slower in a gravitational field.

According to the special theory of relativity, there can be no absolute standard of time. All time measurements are made relative to the state of the motion of the observer. This is different from predictions based upon the general theory of relativity. The latter allows for many, if not an infinite number of possible absolute time choices.

It has also been suggested that the need for a beginning of time originating with breaking of symmetry from a singularity can be avoided. The universe could have an infinite past if there are fundamental measures of things happening in the universe that slow down the farther one travels back into the past. If this was true then time could also be viewed as accelerating forward relatively speaking rather than remaining constant. The effect would be the same. Someone inside the frame of reference (universe) would see time as a constant without accelerated change. However an observer outside the universe looking in would see a continual slowing of time the farther back into the past one looked probably following an exponential curve. To anyone inside the universe time would appear constant.

If on the other hand the farthest out receding galaxies, which seemingly are moving away from us at a faster rate, would have a slowing of time relative to that which we currently would measure from our own system. We could see the time changes in the other galaxy, however someone inside the distant galaxy would not perceive a change.

Space-time curvature is effected when a body moves, or a force acts upon it and in turn the structure of space-time affects the way that bodies move and forces act. Because of the interrelationship of all events, space and time not only affect but are also effected by everything that happens within the universe.

The concept of "imaginary" time has also been introduced as a necessary function in an attempt to unify gravity with quantum mechanics. It is indistinguishable from directions in space and there is no significant difference between the forward and backward directions of imaginary time. This differs from the concept of "real" time, which always moves forward toward the future. The second law of thermodynamics requires forward movement only, leading to the concept of "arrow of time".

There are actually at least three arrows of time that compel its forward motion. In addition to the thermodynamic arrow, which is based upon a state of continued heat entropy with a propensity for increasing disorder,

there is the psychological arrow, which is based upon our ability to remember past events but not the future, and the cosmological arrow which forces time forward because the universe is in a state of expansion not contraction.

Inside an isolated system the perception of time can also vary within anyone individual. A person who has been administered a mind altering drug may experience time at a different rate than during an ordinary consciousness state. It very much is a mental construct requiring a state of awareness. This would indicate the conscious perception of time can be very much different than the actual constant progression of time as it relates to purely physical events. There are two types of time which flow in a forward direction. Physical or proper time is involved in all physical event processes as relates to all matter-energy transactions and is what the physicist works with. Subjective time requires the presence of consciousness and can be perceived very much differently than actual physical time depending upon the consciousness state.

The experience of time by a conscious being is very much determined by matter-energy interactions occurring within the brain. The many neurotransmitters, which are present within the brain and body, can be altered in quantity, or the amount released within any synaptic junction can be altered and this in turn will alter the way time is subjectively perceived. One can perceive time change as faster or slower when in an altered consciousness state. During a near death experience one can re-experience their entire life in a review within a very short time interval with time perception being greatly accelerated. After taking a mind-altering substance, time perception can also be altered so that one hour may seem like two or more hours. The electrochemical changes which are occurring within the brain that alter time perception are very much based upon energy-matter events. Since matter-energy, consciousness-intelligence, space-time are all interrelated as properties of one universal basic substance, these findings described should be anticipated. Any change in the status of one of these basic properties will act as a cause to produce an effect in the others. Likewise any effect produced by any

change in any of these six properties will in turn become a cause producing effects within all of the other properties. It is a universal interrelated feedback situation where all events occurring at any one moment in time accumulatively affect all future events either directly or indirectly. This is one very good reason why the theory would also predict that no two points in space-time can be exactly alike even though our current understanding of quantum mechanics might suggest otherwise. The amount of information required to define each point in space-time would be essentially infinite since each point is being influenced either directly or indirectly by events occurring within every other point throughout all of space-time.

Time is an inseparable part of the basic fabric of the universe and cannot be separated from it. The apparent distinction is artificial, an invention of a reductionist mind. It nevertheless has become invaluable to recognize its distinct properties. By doing so it has allowed science in particular to examine the basis for our existence. It has allowed humankind to develop highly accurate approximations pertaining to physical reality. The level of precision achieved in the particular case of quantum mechanics as previously indicated has reached an accuracy of at least eleven significant figures. It is anticipated that over time science will probably achieve states of even greater precision. Nevertheless the theory predicts that absolute accuracy is not possible because of total interrelatedness of all events on a universal wide basis. The same science of chaos which exists, making it impossible to totally know initial conditions of any process, applies to any mathematical relationships which we have come to recognize. There are many formulae which accurately describe physical processes to the extent that our measuring devices allow precise detection. Just as Newtonian mechanics can only approximate events that occur at extraordinarily high velocities, approaching the speed of light, the same limitations apply to relativistic formulations because of the subtle influences not recognized at the subatomic levels because all events occurring within the universe are interrelated. Every cause produces an effect and every effect in turn becomes a cause.

Superstring Theory

Ever since the theories of special and general relativity, as well as quantum mechanics have been in existence, there has been a concerted effort by physicists to find a way to merge these theories into one grand unified structure, which gives explanation for all physical events that occur within our universe. Until relatively recently, these theories (relativity and quantum mechanics) have seemed to be mutually incompatible. There is now increasing evidence to support the conclusion that a grand unified theory is in the process of being formulated within the framework of superstring theory. The latter provides a single explanation capable of describing all events occurring between all forces and all matter-energy objects. According to string theory, the atomic particles that we have described within the framework of quantum mechanics are not point-like, but rather more like tiny, one dimensional string loops, which are virtually infinitely thin, that vibrate and oscillate. The properties of any quantum particle are determined by the various ways that a string can vibrate. For example, each particle has a mass and a force charge that are determined by the strings oscillatory pattern. Quarks and electrons, and all other particles, have specific vibratory patterns that establish their uniqueness. The various force particles, like gluons and bosons, have their own specific vibratory patterns, as well. Since all particles of matter and all forces that interact between them can be reduced to vibratory strings with specific patterns, this therefore allows for a unification of all physical processes under one theory which potentially can explain all of our material existence. It has not yet been conclusively established that string theory will actually accomplish unification of all matter-energy with the four forces since the exact mathematical equations have not yet been completely formulated. As of now, the underlying mathematics are only approximations. Even so, the theory seems to hold significant promise that eventually it will accomplish what current string theorists envision. This optimism is based upon several breakthroughs that have answered

certain unimaginably difficult theoretical questions which previously defied understanding.

Violent fluctuations in the special fabric at the ultramicroscopic levels (distances less than 10^{-33} cm) have precluded all attempts to incorporate gravity into the framework of quantum mechanics until the formulation of superstring theory. This has allowed the alteration of general relativity in just the right way to make it fully compatible with quantum mechanics. Even though the hypothetical graviton, which is the messenger particle of the gravitational force, has never been directly observed, its properties have been predicted. Other particles have also been theorized before they were actually observed, such as the neutrino which was then eventually found to exist. Superstring theory has recognized a vibratory pattern that perfectly matches the predicted characteristics of a graviton.

A particle's energy is determined by the string's particular vibrational pattern. The greater the string's amplitude of vibration and the shorter it's wave length, the greater it's energy. Energy level is also determined by string tension with higher tension reflecting higher energy. The energy is also determined by the type of vibrational motion both sliding (uniform) and oscillatory (ordinary). The radius of the string loop also helps determine energy level. The smaller the radius, the greater the energy.

The mass of an elementary particle is determined by the energy of the vibrational pattern with heavier particles having internal strings that vibrate more energetically, while lighter particles have internal strings that vibrate less energetically. There is also a direct association between the pattern of string vibration and a particle's response to a gravitational force. A particle's charge is also determined by the precise way that the string vibrates. Messenger particles, which are involved in the transmission of the four physical forces, also have their own resonant patterns of string vibration.

Superstring theory establishes a framework for explaining all of the properties of the atomic and subatomic particles observed in nature. It

also indicates that the basic fabric of all matter-energy and all forces is the same promising a single, all-inclusive, unified description of the physical universe. There is still no way to expose the sub-Planck-scale imperfections in the fabric of space. As previously stated, this is because matter-energy is not separate from space, but gradually dissolves into the fabric of space, being continuous with it. The physicist would also add that our measuring instruments are incapable of seeing objects smaller in size than the particles perceived to be present in the quantum mechanical realm.

There have been five main string theories which, until recently, were thought to be completely separate from each other and were also competitive. A relatively recent breakthrough described by Witten has allowed the five competing theories to be united into a single framework which has been provisionally named M-:theory. This latest theory requires eleven dimensions and contains not only strings, but other objects, as well, such as two dimensional membranes and undulating three dimensional "blobs".

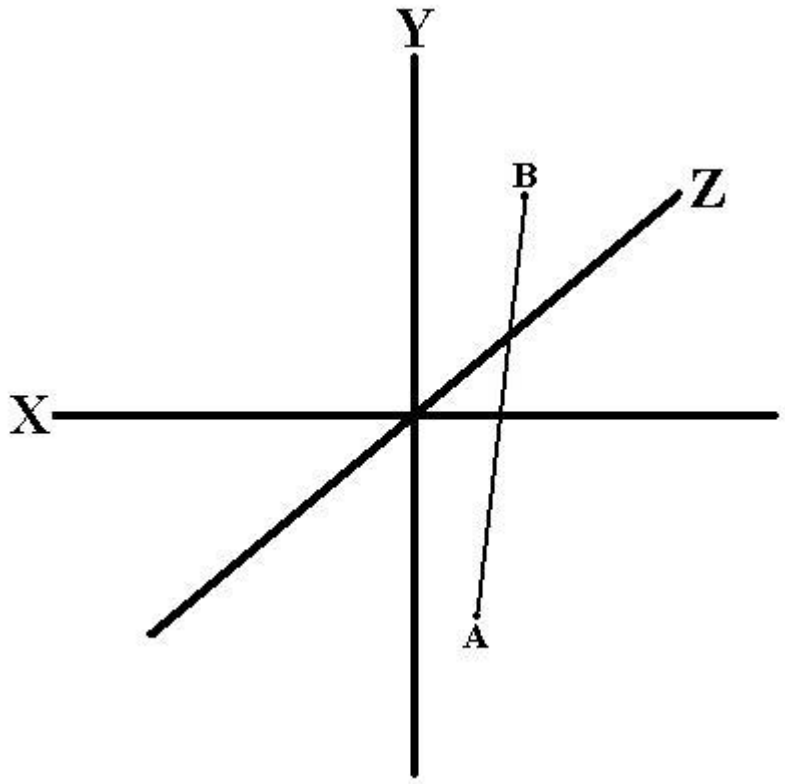
Whether or not superstring theory or some other yet to be imagined physical description eventually proves successful in best representing our microscopic and macroscopic universe, it will most likely remain an approximation with inherent limitations. The approximation might be mathematically precise to an astonishing level of accuracy, however, will represent a construct of the mind limited by whatever measuring devices we will eventually invent. It has become obvious that our description of quantum objects and events is limited and somewhat misrepresentative of reality. Superstring theory may allow us to advance to a new level of precision and merge current existing theories into one all-inclusive theory, but it should also be understood that we are still describing a map of the territory rather than the territory itself. One question I must raise about superstring theory, or any other yet to come that requires a many dimensional universe, is whether our minds are limited and, therefore, incapable of visualizing a space around us that is

eleven or more dimensions, or are our theories and/or the mathematics limited in their ability to accurately describe our reality.

The math developed with quantum geometry would seem to require at least ten and probably eleven dimensions. This seems to puzzle most physicists and has led to the suggestion that the other six or seven dimensions beyond the usual four are "curled up" in space-time.

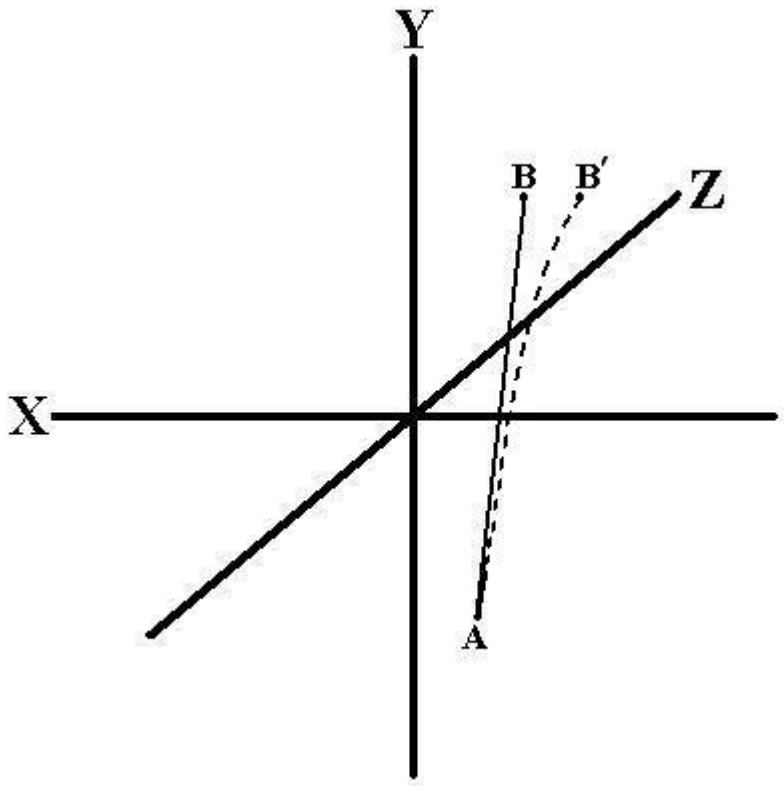
Our mathematical representations of quantum mechanics and even more so, for Superstring theory are trying to describe an analog universe in constant motion, which is also continuously expanding. Our quantum mechanical mathematical formulae would appear to be digitalizing subatomic activity in an attempt to reduce it into a quantized framework. Our classical mathematical models work well in the macroscopic world where Newtonian mechanics operate, but become increasingly imprecise as we delve deeper into the subatomic realm. Superstring theory is attempting to describe subatomic events, which occur at a much smaller level than the diameter of an atomic nucleus. As a matter of fact, the volumes of space being dealt with in Superstring theory are 10^{20} smaller than the diameter of an atomic nucleus. They are describing events, which occur within the range of 10^{-33} cm (Planck length). There are a near infinite number of energy peaks and valleys in a quantum field that are in a constant state of flux that we detect as atomic particles or strings. In concept, the strings, which form atomic particles, are extraordinarily much smaller in size than the atomic particles, as they are visualized within quantum mechanics. Again, the average string loop would have a diameter of 10^{-33} cm. Our measuring devices see these entities as separate objects, either as particles or waves that can be quantized into specific discrete objects. They are being measured as if they are divisible from surrounding space when in reality, they are actually continuous and indivisible from the basic background fabric. Thus quantification will always have a limited accuracy, the smaller the seemingly separate objects are that we are attempting to measure. I would also presume that the mathematics of quantum mechanics and string theory are describing events as they might occur in a steady state

(non-expansionary) universe rather than an expansionary universe where every point in space has a slightly greater volume than it did at any preceding moment, no matter how short the time interval that is chosen. With this in mind, I can continue to picture a four dimensional universe with three spatial dimensions and one of time that requires a mathematical description needing multiple dimensions to accurately work; here is how. If we arbitrarily choose any point in space and mathematically describe it's location on the XYZ axis at time 0, and then trace it's movement in space over a specified period of time, it's final position would differ in an expanding volume when compared to a static non-expanding volume. This, again, presumes an intimate relationship between matter-energy in space-time.



In the above diagram let point A be the initial position of a particle that over a microsecond moves to point B. We can define both points A and B in whatever units we choose, relative the XYZ axis corresponding to our three spatial dimensions. Only three spatial dimensions are required to define each point as long as the surrounding space is not expanding. In an expanding space, the moving particle, however, would not end up

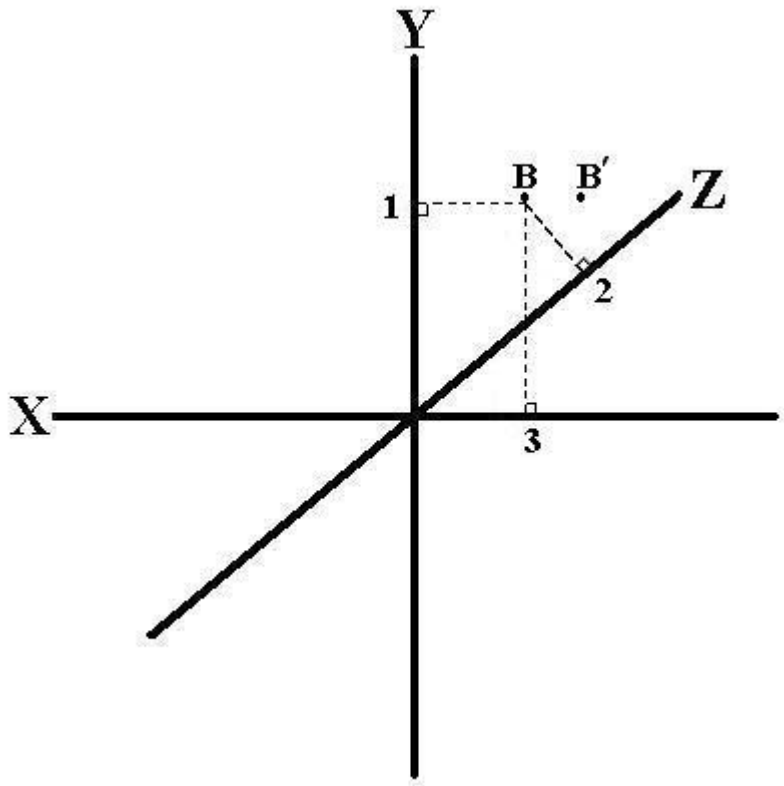
at point B, but rather will be shifted slightly to point B' as indicated in the diagram below.



The slight shifting of point B caused by the expansion of space confuses our quantum digitalized mathematics that is attempting to describe atomic events relative to points A and B (not B'). The positions of points B and B' drawn on the diagrams are separated an exaggerated amount for visual clarity. In reality, they would be extraordinarily close to each other and their position difference would only become noticeable in the quantum or Planck range (10^{-33} cm) but the position difference would confuse the mathematical description in the same way that Newtonian mechanics fails with very rapidly moving objects as they come closer to approaching the speed of light.

So how do we get nine spatial dimensions out of three and two time dimensions out of one for a total of eleven, which precisely coincides with the number of dimensions that are required for Superstring theory, to allow for the unification of field theories with quantum mechanics and relativity along with the four forces (Grand Unification Theory).

If we define the new position of B' relative to the anticipated position of B, the new spatial dimensions are added accordingly.



The new B' location must be defined relative to each of the initial XYZ axis intersecting points (1,2,3). It has shifted in three dimensions away from each intersecting point on each of the XYZ axes. Therefore, to define it's new position relative to the intersecting point on the Y axis requires three new XYZ distance measurements; to define it's new position relative to the X axis requires an additional three new XYZ distance measurements and to define it's new position relative to the Z axis, likewise requires an additional three new XYZ distance measurements. Thus, to define the position of B' relative to it's expected position of B requires nine spatial dimensional measurements.

Moving from point B to B' would also add an additional time burden because of the greater distance as a fourth dimensional time measurement so that the mathematics would require another added dimension to balance out this difference. In a non-expanding space, the time measurement would be the measured distance between point A and point B. Because space is expanding, the added time dimension would

be the measured distance between point B and point B'. In a space-time continuum, time measurement is reduced to a distance measurement. The nine spatial plus two time dimensional measurements add up to the eleven, which according to Witten, is the exact number for Superstring theory to unify relativity and quantum mechanics, as well as gravity with the other three non-gravitational forces. I believe that the "curled up" dimensions of Superstring theory are mathematically present as a manifestation of an expanding space. I am not sure that the various flatlander metaphors are necessary in helping us picture our multi-dimensional reality.

Initial string theories (five main ones) required ten dimensions (nine spatial and one time) for the mathematics to accurately approach the achievement of a grand unification theory. Recently Witten, who according to Brian Greene, is the only modern day physicist who might claim the same level of brilliance as Einstein, has indicated that one more dimension is necessary to achieve grand unification. The only problem with applying my scheme to his eleven dimensions, is that he believes that there should be ten spatial and one time, rather than nine spatial and two time. If one accepts Witten's conclusions, then a grand unification theory has been achieved. His reasoning apparently is very compelling to other string theorists, since not only does he achieve grand unification of all forces, but brings the five main, seemingly separate, string theories under one umbrella where they all are describing different parts of one reality. I don't believe my explanation of eleven dimensions really conflicts with his, since time is a distance measurement in a space-time continuum. I don't claim to understand the mathematics which makes Superstring theory so compelling, but I do understand the concepts well enough to accept the current belief by string theorists, that it really does form the basis of a grand unification theory that merges all forces (gravity included) with the others, as well as with matter-energy, along with the conclusion that they are all properties of one basic substance including space-time. It does unify quantum mechanics with relativity.

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Universal Information Storage Discussion

Basis of universal information storage or memory storage as presented in the book entitled "Integrated Theory of Intelligence".

Memory, which reflects the storage of information, is not stored in the hard wiring of the brain as many mind-brain researchers would have us believe. Certain areas of the brain have been determined to be more important in the processing of memory than others however it is very naive to conclude that memory storage occurs anywhere specific within the brain substance. Those researchers who continue to pursue this concept are doomed to a lifetime of failure. The Ultimate Theory of Everything predicts that memory is imprinted in space-time holographically which allows access to it independent of location within space or time.

This can be thought of as the warping of space similar to what Einstein described relative to the way that gravity governs the direction of celestial bodies, however the image should be visualized as more of a micro-warping. The fluctuations in texture of this warped space would likely be many times smaller than the diameter of the smallest atomic particles. If one were able to visualize the appearance of micro warped space containing memory it would probably look very much like the interference pattern recorded on a holographic plate except that it would be at least four dimensional and constantly changing form. Atomic particles are held in position appearing to comprise solid objects by this micro-warped space. The micro-warped space in actuality is comprised of energy-matter finely and heterogeneously dissolving into the very fabric of space without any demarcating boundaries. There are no particles as such in existence that can be divided into smaller particles. Quarks and electrons are not solid structures but only highly concentrated focused energy. At the present time there is no way to evaluate space at the level of this micro-warping. Thus this is a concept

that will be difficult to explore experimentally through science. The relatively recent invention of superstring theory is approaching this level where memory storage occurs. Nevertheless there are many reasons to believe that the holographic storage of memory is an accurate perception. It allows explanation for virtually all mental events.

There is one property of holography that makes the concept so appealing relative to applying it to memory and mental events. If the holographic plate, which stores the information used to reconstruct a three dimensional image, is broken into many small pieces then the total image can still be reproduced from any of the fragments. The resolution of the image will be less distinct (fuzzy) but it will otherwise be the same as if the entire holographic plate was used in the reconstruction. Memory storage in space-time would appear to behave in similar fashion. No matter what fractional volume of space that one is accessing the information is stored there. The larger volume of space that one is capable of sampling the more clear is the image. Thus, the larger the brain and the more intricate the wiring, the more complete is any thought.

The holographic technique has been described in many articles and books so won't be dealt with in detail. For those who have a desire to gain a greater depth of understanding, I would strongly recommend "The Holographic Universe" by Michael Talbot. Much of the discussion that follows is covered in greater depth in that text. It should be comprehensible to most readers.

A hologram can be produced when a single laser light beam is divided into two separate beams. The first beam is reflected off the object being photographed and the second beam is then allowed to collide with the reflected light beam of the first resulting in an interference pattern that is recorded on film. The encoded image has a very chaotic non-descript appearance, which can resemble the surface of the moon with multiple crater sites. The image has no resemblance to the object that it will be used to recreate. Again it is important to emphasize that if the

photographic plate is broken into many fragments each can still be used by itself to recreate the entire three-dimensional object no matter how small the fragment being used.

The brain functions as if it was accessing a holographic plate with encoded images. This has been well established in both lower animals and humans. Karl Lashley surgically removed various portions of rat brains and submitted them to experimental testing both before and after. He determined that no matter what portions of their brains he removed he could not erase their memories. Their motor skills were often impaired but even with large portions of their brains removed, they could still find their way through a maze.

Paul Pietsch performed similar experiments on salamanders. In a series of 700 operations he performed multiple different types of surgical extractions of brain tissue including flipping, subtraction, and even mincing, but always when he replaced what was left of their brains their behavior returned to normal. Humans following removal of sections of their temporal lobes, which supposedly is very important to memory function, may also retain normal function.

Other examples could be presented illustrating the holographic operation of brain function. There are an increasing number of mind-brain researchers who accept this concept but at present remain in the minority. Virtually all mental events can be explained by the holographic model. It would seem that the actual storage of information occurs more within the space-time arena than the matter-energy (hard-wiring) portion.

Carl Jung became convinced that a collective unconsciousness exists that all humans contribute to and can access. He concluded that dreams, hallucinations, myths, and religious visions derived from this collective unconsciousness. If such an unconsciousness exists, and I believe that it does, its memory would be holographically recorded in space-time. Mystics and other individuals who have reported experiencing omniscient cosmic oneness with the universe, where there is a total loss

of ones individual boundary along with the sense of unity with all life as well as the perception that one is in complete total unity with the entire universe, are likely tapping into a larger volume of the space-time hologram.

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Peak Experience/Abraham Maslow Discussion

Examine the relationship to peak experience as defined by Maslow and how such an experience led to the formulation of "Integrated Theory of Intelligence" which is also an approach to a "Theory of Everything".

Abraham Maslow – Defined peak experience in a very specific way. Led to the formulation of the "Integrated Theory of Intelligence" which discusses the interrelationship of intelligence-consciousness to matter-energy and space-time and the evolution of these properties that define the basic fabric that comprises the universe. Detailed in Preface Part II.

Peak experience as defined by Abraham Maslow, represents a Supraconsciousness state with certain well-defined characteristic features. Much has been written about P.E. and the term has become broadened from its original meaning. The definition that applies to Integrated Theory of Intelligence is briefly outlined below. If a more thorough understanding of peak experience is desired please refer to Part II of the Preface and Chapters 1 and 16.

P.E. represents one of at least several altered states of consciousness and might be referred to as a transient state of supraconsciousness. It is a relatively common occurrence and one poll indicates that over one-third of all individuals claim to have had one: Maslow first discovered what he called "peak experiences" in self-actualizing individuals; however, it gradually became apparent to him that a great many people have them. He believed that so-called "mystical experiences" were essentially the same thing as P.E. I believe that they are the same, but prefer the term P.E. because of the lack of supernaturalness implied by the latter. P.E. is also a phenomenon, which has been evaluated scientifically, and should

be readily accepted by many to represent a valid altered state of consciousness, with only its source remaining in question.

Maslow concluded that during a P.E. people have a better, truer perception of reality. During this altered state an individual achieves the same insights that many philosophers have had regarding the unifying aspects of reality. Some of the words he compiled which are common to P.E. include truth, beauty, joy, ecstasy, wholeness, dichotomy-transcendence, perfection, order, simplicity, uniqueness, justice and completion.

Briefly stated, Maslow describes the major features of a peak experience in the following way, which also should again be noted as paralleled by my own experience. One has the perception that the universe is a totally integrated and unified whole and that one is a part of it. A "cosmic consciousness" is experienced so that the whole cosmos is perceived as a unity and one's own place in this whole is simultaneously understood. Self-boundaries are lost as one becomes integrated with the rest of existence; however, self-identity and individual awareness persist.

During a P.E. one's concentration is totally absorbed and there is the truest and most total kind of visual perceiving or listening or feeling." One experiences superhuman, almost "god-like" perception of apparent reality. There is a feeling of omniscience. Great insights and revelations are achieved and profoundly felt, associated with feelings of intense joy and ecstasy. The experience alters one's perception of the meaning and value of life, and makes life seem much more important and worthwhile. There is a time and space disorientation so that the ability to estimate a time interval is lost.

The dichotomies, polarities and conflicts of life are transcended and resolved. The world is seen only as a beautiful, good, desirable place to be. It is never experienced as evil. The presence of evil is accepted and understood as part of the whole - as being unavoidable and necessary. During the omniscient perceptive state, evil is seen as a product of limited or selfish vision and understanding. The greater the

understanding, the less the condemnation or blame, disappointment and shock that will be experienced. There is a transient loss of all anxiety, fear, confusion, conflict and inhibition. It produces the long-lasting effect of one becoming more loving, honest, innocent, non-needing, less selfish, and even more god-like. One is left with an all-embracing love for everybody and everything, which in turn leads to a strong impulse (drive) to do something good for the world. There is an eagerness to repay the peak experience with a sense of obligation and dedication to humanity. The best verbal description of a P.E. is not nearly good enough, since words cannot begin to capture the essence of the experience!

There are many reports of creative acts that have apparently occurred during altered states of consciousness, thus supporting the commonly held notion that altered states allow the unconscious process to operate more freely. Harman and Rheingold, after researching case histories of scientists, "found that not only many specific scientific discoveries but the very foundations of science itself were built on breakthrough experiences, later backed up by empirical investigation”

When the Integrated Theory of Intelligence was first developed in 1984 there was less scientific evidence to support the conclusions offered in the text. Since then there has been considerable progress and there is more scientific evidence accumulating to support the theory. For those that are interested, a reading list of books can be accessed through this web page, each with a short synopsis summarizing how the information within the book gives additional support to the concepts presented in Integrated Theory of Intelligence.

It is the author’s belief that in time the theory as presented will become a commonly held worldview within the scientific community. If so, this will be strong evidence toward validating the importance of P.E. as a source for breakthrough insights.

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Theory of Everything Discussion

Examines current concepts relating matter-energy to space-time and the fundamental forces of nature as physicists are currently attempting to do; however, also interrelates intelligence-consciousness to this formulation.

The "Theory of Everything" is a term originally coined by physicists to imply a general theory that beautifully and simplistically unites all current knowledge of our physical reality under one holistic description. It would merge understanding of all the known physical forces which seem to define our universal physical reality, as well as all objects contained within, extending to its outer limit. There are those physicists and cosmologists who believe this might even be achieved within the next generation. Some have devoted their professional lives to the attainment of this objective. Einstein devoted the later part of his career toward this end without success. There are those physicists who are developing superstring theory that believe a Grand Unification Theory is currently being formulated.

Do the odds favor the required breakthroughs in insight for this goal to be achieved? The answer is probably yes if this theory ignores the most obvious and important part of our existence, that being the presence of intelligence and consciousness which are the most active ingredients comprising mind. However, if the latter is not included within the framework of this theory then I contend that whatever theory evolves should not be entitled to be referred to by that name. At most it might be called the "Physical Theory of Everything". To be complete a theory of everything must not omit any facet of our perceived reality. I believe that what is being presented will begin the framework for a complete and comprehensive theory encompassing both our physical and mental reality. Such a theory would have to deal with the presence of mind, thoughts and feelings and whatever part they play in the grand scheme

of things. Many will challenge this work as an impossible task however I would respectfully suggest that it is not only possible but that the following text represents a strong foundation that interrelates all known concepts of our reality.

The theory requires the acceptance of certain basic assumptions. There is strong scientific evidence to support most of them. These assumptions will be stated early in the discussion. If one is uncomfortable with the assumptions then they will in all probability be uncomfortable with the theories conclusions. This is the only text that I have become aware of that attempts to integrate all facets of our existence into one all-inclusive theory. This claim cannot be made if certain concepts, which have traditionally been categorized as spiritual, are excluded. By interrelating scientific, philosophical and spiritual concepts a rather complete model begins to emerge that integrates all facets of our existence.

The completion of this theory will ultimately await the mathematical description, which will best be provided by physicists as they eventually fill in the details. This transcends my ability as a non-physicist with limited mathematical skills. Nevertheless it is my belief that my current understanding of both physics and mathematics is sufficient to present the following theory which will include: (a) description of the origin of the universe, (b) give greater understanding to the concept of gravity and how it operates, (c) relate the concept of a superforce that was probably present in the early moments of our universe which then evolved into our currently recognized physical forces, (d) discuss the principal of holographic distribution of information throughout all of space, (e) include other concepts usually confined to the domain of the physicist. I would ordinarily leave the responsibility of presenting a theory of everything to the physicist, however there is little doubt that it would not include the relationship that mind and other mental constructs have to matter-energy and space-time by ignoring the presence of intelligence-consciousness.

The theory will also advance the concept that the universe began as one single basic homogeneous substance with divergent properties, which allowed it to evolve into its present form with the apparent distinct entities that we recognize seemingly separately as matter-energy, space-time and intelligence-consciousness.

The theory will be so bold as to suggest the presence of a creative force, which was and is one of the properties of the basic substance that permeates the universe. Most scientists would choose to deny such an entity, not so much because of disbelief, but rather because there is no way to currently test such a belief. It cannot be measured therefore it must not be considered scientific. It is my understanding that most scientists have some belief in a higher power that transcends science but so far have found no way to incorporate this concept into our physical reality. There is currently no known way to measure the presence of consciousness. Tests that have been devised to ascertain the level of human intelligence are crude at best. The presence of animal intelligence and consciousness has been largely ignored. The best that science has been able to achieve in the study of intelligence-consciousness is to suggest that it represents an epiphenomenon arising from the electro-chemical events, which are continuously occurring within the brain. This theory concludes otherwise and predicts that intelligence-consciousness will in time be recognized as being primary and not a secondary occurrence. Its presence was proactive in the development of the universe's current state of complex evolution and was present at its beginning.

It is my contention that there are compelling reasons to admit to the existence of a creative force. I will submit a way to test for the presence of such a force. I believe that the test is already in progress and only needs to be recognized and interpreted. It is based upon Newton's second law," F=ma". This one concept is arguably the most important question we as humans might care to answer other than what, if anything, awaits each of us following death. By now there must be raised eyebrows because of the apparent audaciousness of such a

seemingly incredible claim. Please keep an open mind and follow with me.

When the "Integrated Theory of Intelligence" was first written it was considered to represent an outline of an essentially complete world view. The author was not aware of the term "Theory of Everything" at the time. Since then a further attempt is being made to blend the information contained within "Integrated Theory of Intelligence" with that being developed by the physics community. It is the author's opinion that any "Theory of Everything", eventually presented must be largely based upon a physical description of the universe as being developed by physicists and now cosmologists. So far, however, both disciplines have generally failed to incorporate the concepts of consciousness and intelligence into their theories preferring to subjugate them to the status of an epiphenomenon. It is my very strong belief that any theory will fail that doesn't incorporate the concept of intelligence-consciousness as one of its primary ingredients of the universe.

The "Theory of Everything" that I am presently working on is based upon the premise that there is one basic substance that permeates our universe, which manifests the properties of matter-energy, space-time, and intelligence-consciousness. These ingredients are completely interrelated and interdependent. I would suggest the acronym "MESTIC" (matter-energy-space-time-intelligence-consciousness) as a word to refer to this basic substance. If one is more spiritually oriented, one might substitute the last letter in the word energy (y) for the first letter (e) and produce the word "MYSTIC". Since the author sees himself as a spiritually oriented scientist he favors the latter spelling.

Whether one develops a worldview or Theory of Everything based upon quantum mechanics and general relativity, superstring theory or any other competing concept, the Integrated Theory of Everything works with all of them equally well.

Even though the Integrated Theory of Intelligence could act as a foundation for a Theory of Everything, it ultimately will require a

completed mathematical formulation developed by physicists and cosmologists liberally borrowing from all other physical and biological sciences. All fields must ultimately fit under the umbrella of the completed theory.

Currently there are some scientists who are suggesting that "information" must be considered as one of the basic ingredients comprising our universe along with matter-energy and space-time. This has developed since the original formulation of the Integrated Theory of Intelligence in 1984. This comes yet one step closer to recognizing that our current physical description is incomplete and that there is more to our universe than just matter-energy and space-time.

In Chapter Four I differentiate between the terms "Information" and "Intelligence", and state that:

<u>Intelligence</u> = (Information + Consciousness)

Or

<u>Information</u> = (Intelligence – Consciousness)

In other words, the term "Intelligence" implies the presence of an active ingredient, and the term "Information" implies a more sterile, inactive entity. In either case the mathematical relationships that are suggested in the Integrated Theory of Intelligence relating "Intelligence" to matter, energy, space, and time work equally well if the word "Information" is substituted.

If one is convinced that there is no higher power and that consciousness is simply an epiphenomenon created by the electrochemical events, which are occurring within the brain, then one could still use the acronym "MESTI" (matter-energy-space-time-information).

It is my strong belief that trying to plug the hole in a Theory of Everything using only “information” as the added ingredient will still ultimately fail. I again respectfully suggest that it will eventually be recognized that there is one basic ingredient that comprises our universe and it has the properties of matter-energy, space-time, and intelligence-consciousness.

Before dealing with specifics of the theory it is important to state any assumptions that are being made. If any of these are proven erroneous then the theory would require modification. Most of the assumptions would appear to be based upon relatively strong scientific evidence. They are listed as follows:

A. The universe began as the" Big Bang" theory suggests approximately thirteen plus or minus five billion years ago and has been in an expansionary state ever since, and will continue to do so for an indefinite extended period of time well into the future. Work in progress is trying to determine whether this represents a cyclical process with repeated expansionary and contraction states (closed universe) or whether this is a one time phenomenon with a continuous expansion without end (open universe). The current theory being discussed is comfortable with either alternative.

B. The moment prior to the Big Bang a singularity or near singularity state was in existence that was comprised of a homogenous extraordinarily highly energized undifferentiated substance confined to an extraordinary small volume of space without any recognizable form but with the inherent potential to evolve into the complex systems that we currently observe around us.

C. Physics, as we understand it, would apply to the entire universe and not be limited to any geographical location. There are also certain predictions, which the theory postulates some of which go beyond what science can currently measure or otherwise

determine. In time most if not all should be verifiable. The following predictions are included:

1. A creative force permeates the entire volume of the universe as a primary property, which was present at its origin and has manifested itself every step of the way influencing its evolutionary development. Evidence of its existence will be presented in another section. See "Creative Force".

#2. There is one basic substance, which permeates the entire volume of the universe that began as a homogenous completely undifferentiated entity devoid of information but with emergent properties that we can now recognize as matter-energy, space-time and intelligence-consciousness. Our entire reality can be reduced to these elements.

#3. Consciousness-intelligence is an emergent primary property of the universe that was present at the big bang and is not a secondary epiphenomenon as suggested by many current researchers.

#4. The manifestation of intelligence-consciousness as it relates to our physical reality has been evolving within increasingly complex systems at a continuously accelerated rate, perhaps exponentially. There is much scientifically compiled data to support this concept. Even now relative to human discovery we observe information accumulation with a persistent doubling rate of every seven to ten years.

Both complex physical systems that contain information and living systems with inherent intelligence follow the same type of evolutionary accelerated time curve. All systems whether living or not follow an evolutionary pathway from simple to complex that would appear to be exponential.

#5. Every interaction that occurs on a subatomic, atomic, microscopic or macroscopic level is interrelated with both cause and effect. Not only does this concept apply from moment to moment but extends back to the origin of the universe. The current universe as we observe it should be seen to represent a sum total of every type and all interactions which have occurred since the big bang. Every atomic energy interchange involving photons and particles affects every other interchange either directly, if close by, or indirectly if at a distance. This is analogous to the "butterfly effect" which states that an insect flapping its wings in China will ultimately affect the weather in Richfield, Utah no matter how immeasurable.

#6. There are no solid particles on an atomic or subatomic level. What we recognize as particles (protons, electrons, quarks, etc) are simply highly concentrated focal collections of stabilized energy, which in actuality do not have any distinct boundaries but dissolve into surrounding space as an infinite regression. Even these focal energy collections don't exist independently of space but are actually a concentrated form of space itself.

#7. Space within the boundaries of our universe is never a complete vacuum no matter how rarefied. Virtual atomic particles can appear seemingly out of empty space and exist momentarily before dissolving and disappearing back into seemingly empty space. They can do this because they are a property of space and do not exist independently of it. All aspects of our physical reality are different manifestations or forms of one basic universal substance, which permeates the entire volume of the universe.

#8. No two points in space, including atomic particles are exactly alike. They can be so similar or nearly alike that

their differences are currently immeasurable. All "electrons" or other apparent particles are not exactly alike even though they appear to be. This concept holds true of all matter-energy no matter how large or small of a volume one is sampling. This will be explained later and has to do with the holographic recording of information within space and is also a manifestation of chaos.

#9. Being essential properties of space, intelligence-consciousness is distributed throughout the entire volume of the universe just as is matter-energy. Its distribution is uneven (heterogeneous) being concentrated in some areas and rarefied in others.

#10. There is a universal memory that permeates all of space, which all systems contribute to whether living, or not. The information within this memory is holographically distributed so that it can be accessed, at least to some degree, from anywhere. The density of information distribution is uneven within this hologram. Every event that occurs imprints a memory within space. If one were to visualize the form space takes relative to the recording of memory it would look like the interference pattern of a photographic plate used to reconstruct a hologram image except that it would be multidimensional rather than a two dimensional flat surface. It is also considered probable that every event, as it is recorded within this interference pattern, imprints the hologram more intensely at that point in space where the event occurred. Thus every memory likely has an epicenter within space, beyond which its influence drops off the farther the distance from the epicenter one travels. This holographic memory is continuously changing over time as new memories are added to previously recorded ones.

11. The expression of intelligence-consciousness within life forms has occurred exponentially with humans being the most advanced objects to have evolved to date that we have yet observed. Humans are still continuing to manifest increasingly higher levels of intelligence and consciousness at an exponential rate. This is currently difficult to recognize because of the relatively short life expectancy that humans possess. This theory predicts that the exponential increase in intelligence-consciousness will continue.

#12. The universe will continue to undergo evolutionary change leading to systems of increasingly greater complexity resulting in the structuring of forms richer in information.

#13. Gravity can be seen from the point of view that it is a reflection of the sum total interactive accumulation of all atomic and subatomic events that have ever occurred since the moment of creation and continue to occur from moment to moment. The position of each galaxy, star, planet and all other objects are stationed where they are as the result of the virtually infinite number of matter-energy interactions which have occurred since the moment of creation resulting in warped space. The direction that each object currently travels through space is a continuation of this totally interrelated process. This also allows one to picture a gravitational process that is entirely based upon forces pushing against each other rather than some nebulous attraction reaching across space.

#14. All phenomena have both a cause as well as an effect since all occurring events are interdependent (yin-yang).

15. Other conscious life forms exist elsewhere within our universe that are probably quite numerous and are probably

distributed heterogeneously throughout all galaxies. Currently there is no scientific evidence to support such a hypothesis. Over time science will hopefully discover ways to test the assumptions and postulates. In the meantime the strength of the theory rests upon the seemingly elegant way that it all fits together formulating a picture of our existence that approaches being all inclusive without significant contradiction, giving an explanation to all aspects of our experience leaving nothing of substance out. A theory must achieve all of the above to qualify as a "Theory of everything".

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Creative Force Discussion

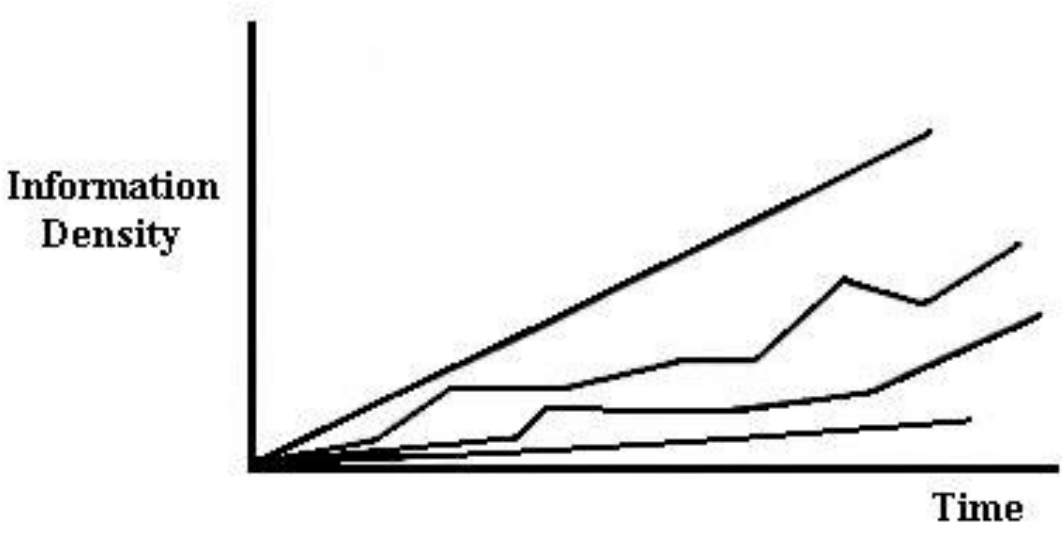
Explore the relationship of cosmic evolution from the big bang to the highly complex systems of our current universe as outlined in the book entitled "Integrated Theory of Intelligence" which is one approach to a "Theory of Everything".

Since the acceptance or denial of a creative force is of overriding importance to the formulation of this theory I shall deal with it first. Required evidence for such a force goes beyond anyone's intuitive basic belief system. Even though intuition has always suggested to me that our extraordinarily complex universe could not have occurred by chance, because of the enormous number of required coincidences, I still have found myself questioning this belief many times earlier in my life. As a scientist, I am uncomfortable with any concepts or postulates that cannot be observed, tested and measured. Nevertheless since my own observations have forced me to accept the overwhelming probability that mind, consciousness and intelligence are a primary rather than a secondary emergent epiphenomenon, I have had the need to develop a more all inclusive theoretical description of our existence. If one can eliminate the attempt by science to exclude mind, and the properties of mind, from various hypothesis and theories, then an understanding of our total reality emerges which integrates all aspects of our existence into a relatively simplistic and beautifully unified scenario. Most of the puzzle pieces fall into place laying a solid foundation upon which we can then build.

The Ultimate Theory of Everything predicts that a creative force is an inherent primary property of the universe and has been present from the very beginning of the expansionary process. According to Newton's second law a force is said to exist any time an acceleration is taking place. If no force is present then any body or process moving through

space does so at a constant velocity. If it can be established that the evolutionary process from simplicity to complexity has occurred at a continuously accelerated rate then this by definition indicates the presence of a force.

For those who would contend that the evolution of life and humankind was a chance phenomenon I would respectfully suggest that if this were the case then the evolution from simplicity to complexity would have occurred at a rate no greater than a straight line direct proportion rather than on an accelerated basis. A non-creative "chance" evolutionary process could have occurred at innumerable rates none of which would have exceeded a straight line time scale. The following time curves would be anticipated if evolution occurred by chance.



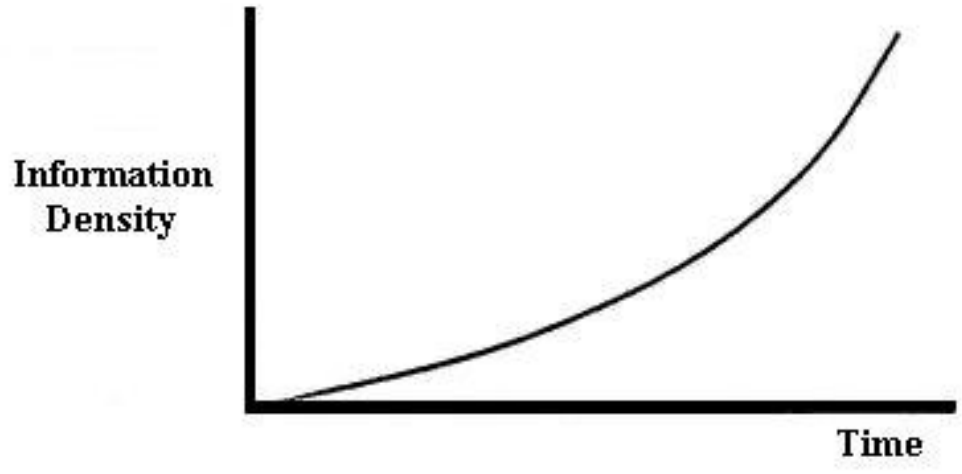
Chance evolution could have occurred more slowly as illustrated with straight or fluctuating time lines but not on an accelerated basis as suggested by the geological record.

If a creative force has permeated the universe then what type of

evolutionary time line might be anticipated? Whenever a force is present it can be detected by an acceleration process. If there is no acceleration resulting in a constant velocity then no force is present. If it could be demonstrated that the evolution to complex systems occurred at a

continuously accelerated rate then this would indicate the presence of a force. The cosmological and geological clock would strongly suggest that the evolutionary process, whether measured in terms of a system's information content or level of intelligence, has occurred at an accelerated rate, perhaps exponentially. If it can be scientifically proven that the course of evolution has occurred in this manner then this would argue for a creative force.

Science has described an evolutionary process of the universe from its very beginning. At the moment of the big bang the universe was in a state of maximum energy density and chaos without any order. It has been progressively evolving to a state of lower energy density and higher order ever since. This evolutionary change can be seen to have occurred in accelerated fashion over time. The geological record would indicate that this process of evolving order has not only been accelerating but has probably been doing so exponentially. The appearance of systems containing higher information content began very slowly and has been continuously accelerating over time ever since at an exponential rate.



Again assuming that the systems of higher information content have been evolving at an accelerated rate, whether exponential or not, this would suggest that a force, or more appropriately a "creative force", is present.

The rate of evolutionary change from simple to complex systems can best be appreciated by viewing what might be referred to as the cosmic calendar and constructing a graph plotting the paleontologists estimates of various arrival times of different life forms against each organisms estimated relative intelligence. This is given in more detail in my prior work "Integrated Theory of Intelligence", page 6.2. It also represents an expansion of information provided by Carl Sagan in his book "The Dragon's of Eden".

If the entire history of the universe were compressed into a single year, again referred to as the cosmic calendar, then the origin of life would have occurred around the last part of September and the entire recorded history of man would occupy the last ten seconds of the year.

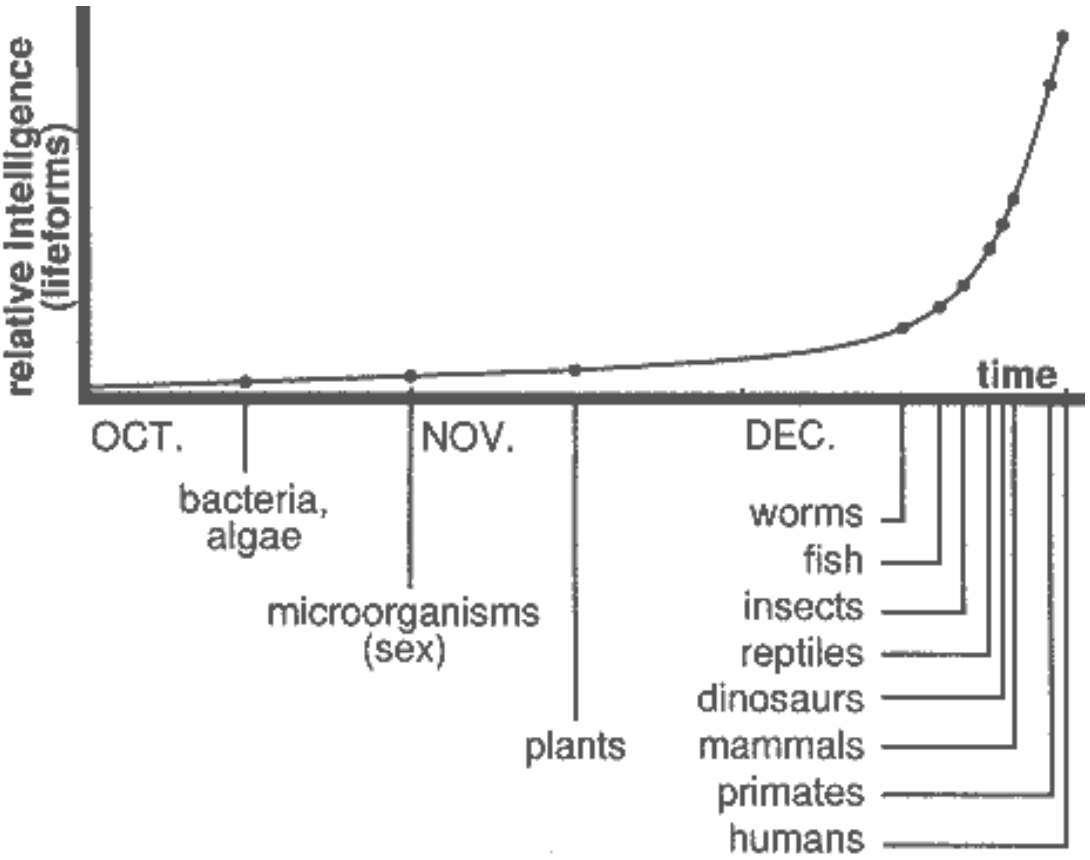
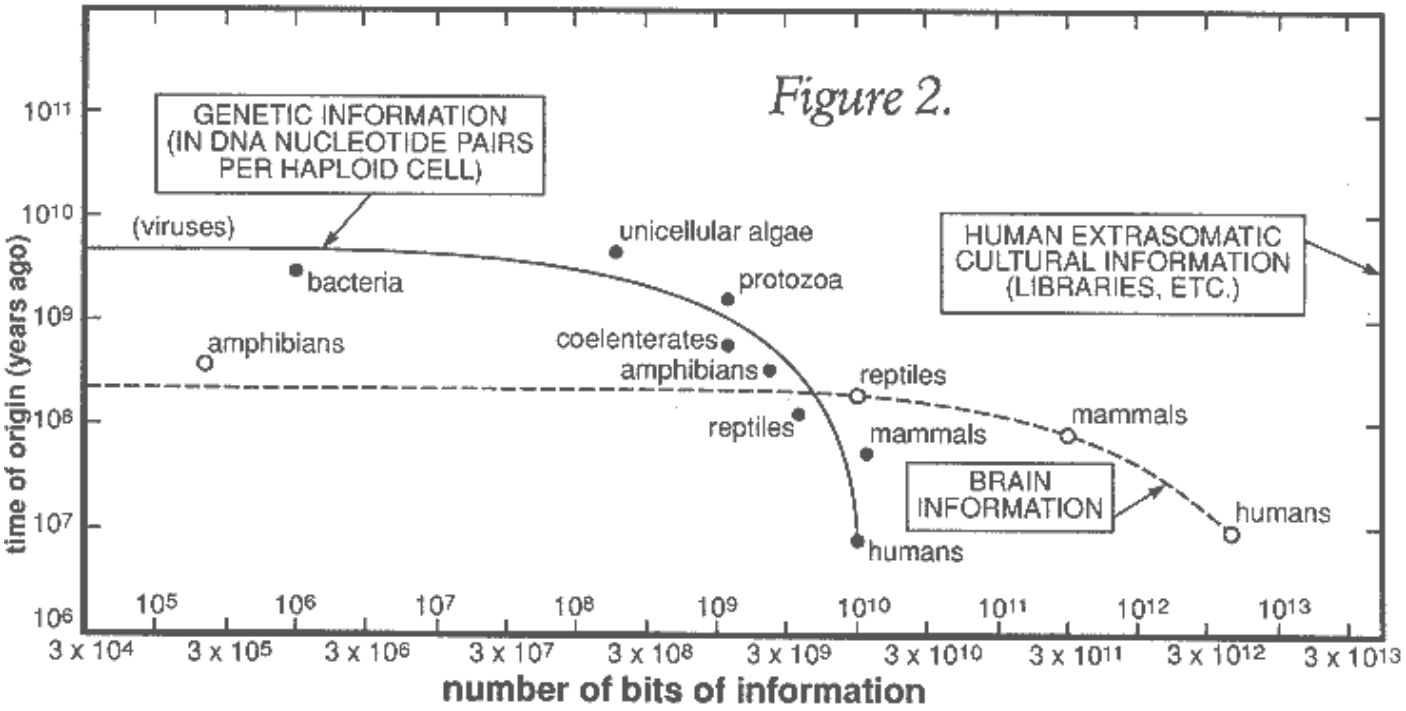


Figure 1.

The first worms would have appeared on approximately December fifteenth, the first fish and vertebrates on December nineteenth, first insects on December twenty first, first reptiles on December twenty third, first mammals on December twenty six, first primates on December twenty ninth and first humans on December thirty first.

The non-linear upward evolution of intelligence is also manifested by tracing the continued increase in information as seen during the history of life on earth. This can be plotted on a graph in two ways, as suggested by Carl Sagan. The solid curve represents the number of bits of information contained in the genes of various taxa, whose time of origin in the geological record is also roughly indicated. The dashed curve represents an approximate estimate of the evolution in the amount of information in the brains and nervous systems of the same organisms. Both curves are clearly non-linear.



This creative force could even be theoretically calculated by applying Newton's second law, "F=ma". It is not necessary to be able to make

such a calculation to prove the existence of this force, although it some day may be possible to do so. We would first need to know the total mass of the universe as well as the rate of evolutionary change (acceleration) from simple to more complex systems extending from the origin of the universe to the present time. It is my current belief that the only relevance in recognizing that evolutionary change has occurred exponentially is the offering of scientifically supported data that a creative force must therefore be present. This still leaves plenty of room for debate as to whether this creative force is conscious or unconscious.

F = ma

F = Creative Force

m = total mass of universe including both matter and energy forms.

a = rate of evolutionary change that the universe has undergone toward an increasing degree of complexity. It would appear that the formation of ordered systems out of chaos has been, and is continuing to occur, exponentially. Creative force = (universal mass) (exponential evolutionary time change from simple to complex systems)

According to Alan Guth, who is now rather famous for his inflationary theory that he applies to the early moments of the universe, the required rate of expansion of the universe is so precisely necessary for an evolutionary process to occur, leading to our current status, that any rate even slightly less or greater could not have worked. He indicates that the rate of expansion of the universe is within fifteen significant numerical figures of that required for a universe that will continue to expand indefinitely into the future or one that would have collapsed back upon itself soon after its origin. The universe would not have survived if the rate of expansion had been either more or less than .000000000000001 % its current rate. This would also suggest that our universe, as it has evolved, must have been guided by a creative influence since the

possibility that it was a chance occurrence would be extraordinarily small if not virtually nonexistent.

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Cosmic Consciousness Discussion

Evidence is provided that supports the concept of a universal consciousness as developed in the book entitled "Integrated Theory of Intelligence" which is also an approach to a "Theory of Everything".

As humankind has become increasingly more enlightened, there are those who have become aware of what has been perceived to represent a Universal Consciousness. This entity has been given a wide variety of names by the various individuals who have come to recognize this phenomenon as reflected in the list of key words above.

Religiously oriented people refer to this entity as God. Others who choose to avoid the use of this emotionally charged term have invented other words to describe this essence. Most people have some sense of a “higher power”. This belief can be based upon either intuition or logic.

More and more people are having what might be called a spiritual experience, or enlightenment. This has been a common phenomenon in “Eastern” mysticism but has been rather historically uncommon in “Western” religious traditions.

The increased incidence of this type of experience in Western culture led Abraham Maslow to spend most of his professional career in its study. He gave legitimacy to this concept through his exhaustive analysis spanning many years. Although he named this phenomenon “peak experience”, there can be no question that what he was describing is essentially the same thing that Eastern mystics have labeled mystical experience or satori.

Although the experience is ineffable (cannot be meaningfully described through language) there are a few descriptive concepts that can be presented. To achieve p.e. one is either in or enters into a meditative

state. He/she feels a total connection to the rest of the universe where the perceived external boundary of ones body and mind (consciousness) are lost. There is the perception of being totally “one with the universe”, or universal mind. There is also the perception of being totally omniscient where one has access to all knowledge having a complete understanding of everything. During this time one is also experiencing the feeling of total love, acceptance and peace. This experience is described in more detail in “Integrated Theory of Intelligence”.

The concepts of Universal Mind or Universal Memory, Collective Unconsciousness and other variations of this same theme are also discussed and related to physical phenomena such as the holographic distribution of information throughout all of space (universe).

The book addresses the interrelationship of mind (intelligence-consciousness) to matter-energy and space-time.

There was one solitary substance comprising the basic fabric of the universe at the moment it began its expansionary process from a singularity approximately 13 billion years ago. This substance quickly began manifesting the properties of matter-energy, space-time, and intelligence-consciousness. Every aspect of our existence can be defined by this elementary substance. Modem day physicists would confine the basic ingredients to matter-energy in space-time, ignoring the presence of intelligence-consciousness, which I respectfully suggest is the most active portion of the universal basic fabric. The entire universe is heterogeneously infused with matter-energy and intelligence-consciousness in space-time.

The author is currently working on a project that he entitles "The Ultimate Theory of Everything". As a manifestation of intelligence-consciousness, the Ultimate Theory of Everything predicts that there is a universal mind, which permeates the entire cosmos that is manifested as intelligence-consciousness interacting with matter-energy in space-time. It has directed the evolutionary process from the beginning. It in essence is the Creative Force referred to in the previous chapter. This universal

mind was present at the moment of the Big Bang and has been continuously directing the evolutionary process ever since. The conscious human mind that we each experience on a daily basis is not an epiphenomenon as some would have us believe but rather an extension of a universal wide consciousness which has been continuously present from the moment of the Big Bang. Natural selection has also been shaping this evolutionary process but more in the role of an editor.

Our universe is a balance between order and chaos. Initially chaos greatly overshadowed order. 13 billion years of evolution have brought a proportionately greater abundance of order with decreasing chaos over time. At the moment of the Big Bang the energy density of the universe was at its maximum, which also meant that chaos was at its maximum and order was at a minimum. For order to be imposed upon chaos there had to be a tremendous drop in energy density, which required the expansion of the universe into a greater volume of space. It took billions of years for the universe to expand into a large enough volume that the energy density could decrease to a more manageable level allowing more highly complex systems to evolve. The universal mind could orchestrate the evolutionary process with greater facility as chaotic energy became more manageable with a decreasing energy density. An analogy placed on a human level might be an individual's relative ease in controlling the deflection of a fast-moving, small rubber ball compared to the likelihood of injury from a lead ball of similar size moving at the same velocity. The energy density of the rubber ball is much less than the lead ball.

At the moment that the universe began its expansion the solitary substance comprising the basic fabric was in a homogeneous undifferentiated state. It immediately thereafter began to manifest the properties of matter-energy and intelligence- consciousness in space-time. At the moment the expansion began intelligence- consciousness was in an undifferentiated unitary state. As matter-energy began to divide into seemingly elementary particles, intelligence-consciousness also started the process of fractionation. The universal mind thus began

the evolution from a totally unitary state to one comprised of a great multitude of seemingly separate conscious forms. Some 13 billion years after this division of intelligence-consciousness began, we witness ourselves as humans with our individual self awareness. The evolutionary process apparently required this extended period of time to develop complex systems capable of supporting the human condition with individual consciousness.

It is also increasingly obvious, as we become more sophisticated in studying other life forms, that intelligence-consciousness is not limited to humans. We don't have to search the cosmos to find other species that manifest intelligence-consciousness. We are gradually finding ways to elicit the presence of intelligence-consciousness in high mammals. There are also those researchers who are beginning to recognize purposeful behavior in even lower life forms such as single cell organisms and even plants. Intelligence-consciousness didn't just suddenly appear in humans but required a gradual evolutionary process through a great multitude of lower life forms. Intelligence-consciousness began in a unitary state and has undergone continued division into seemingly separate forms of continuously increasing complexity.

As individuals with our own self-awareness we still remain a part of the differentiated whole. There continues to be a universal mind, which permeates the entire cosmos and continues to increase its spatial volume as the universe expands. All life forms with intelligence-consciousness are an integral part of the whole, based upon the premise that all things are interrelated. Each individual consciousness contributes to universal memory, which is one of the characteristic features of a universal mind. As the universe expands its spatial volume it allows room for continued storage of new memory both throughout the entire cosmos as well as within each individual. Memory as we now experience it would not have been possible within the early universe. This is because there was a relatively small volume of space compared to the amount of matter-energy present. It is suggested that each time the spatial volume of the universe doubled during its expansion, its capacity to store memory also

at least doubled. The process of memory storage began at the Big Bang and has been increasing exponentially ever since.

As will be addressed later the storage of memory within space-time would appear to occur holographically. A complete history of all events is ultimately stored. Each memory imprint would appear to be a function of the intensity of the event which is being recorded. All events that involve intelligence-consciousness which have occurred since the Big Bang are recorded in the universal memory as part of the universal mind. The continued expansion of space-time is a prerequisite for continued increasing memory storage.

It will also be suggested later with elaboration that each of us can access this universal memory under certain conditions such as peak experience.

To have an appreciation as to how information is recorded in memory it requires some knowledge of the holographic process. This principle will be briefly addressed below along with other concepts based upon holographic memory storage that can explain such phenomena as past life memory experience, mental illness, religious experience, etc.

Memory, which reflects the storage of information, is not stored in the hard wiring of the brain, as many mind-brain researchers would have us believe. Certain areas of the brain have been determined to be more important in the processing of memory than others, however it is very naive to conclude that memory storage occurs anywhere specifically within the brain substance. Those researchers who continue to pursue this concept are doomed to a lifetime of failure. The Ultimate Theory of Everything predicts that memory is imprinted in space-time holographically which allows access to it independent of location within space or time.

This can be thought of as the warping of space similar to what Einstein described relative to the way that gravity governs the direction of celestial bodies, however the image should be visualized as more of a micro-warping. The fluctuations in texture of this warped space would

likely be many times smaller than the diameter of the smallest atomic particles. If one were able to visualize the appearance of micro-warped space containing memory it would probably look very much like the interference pattern recorded on a holographic plate except that it would be at least four dimensional and constantly changing form. Atomic particles are held in position appearing to comprise solid objects by this micro warped space. The micro warped space in actuality is comprised of energy-matter finely and heterogeneously dissolving into the very fabric of space without any demarcating boundaries. There are no particles as such in existence that can be divided into smaller particles. Quarks and electrons are not solid structures but only highly concentrated focused energy. At the present time there is no way to evaluate space at the level of this micro warping. Thus this is a concept which will be difficult to explore experimentally through science. The relatively recent invention of superstring theory is approaching this level where memory storage occurs. Nevertheless there are many reasons to believe that the holographic storage of memory is an accurate perception. It allows explanation for virtually all mental events.

There is one property of holography that makes the concept so appealing relative to applying it to memory and mental events. If the holographic plate, which stores the information used to reconstruct a three dimensional image, is broken into many small pieces then the total image can still be reproduced from any of the fragments. The resolution of the image will be less distinct (fuzzy) but it will otherwise be the same as if the entire holographic plate was used in the reconstruction. Memory storage in space- time would appear to behave in similar fashion. No matter what fractional volume of space that one is accessing the information is stored there. The larger volume of space that one is capable of sampling the more clear is the image. Thus, the larger the brain and the more intricate the wiring, the more complete is any thought.

The holographic technique has been described in many articles and books so won't be dealt with in detail. For those who have a desire to

gain a greater depth of understanding, I would strongly recommend "The Holographic. Universe" by Michael Talbot. Much of the discussion that follows is covered in greater depth in that text. It should be comprehensible to most readers.

A hologram can be produced when a single laser light beam is divided into two separate beams. The first beam is reflected off the object being photographed and the second beam is then allowed to collide with the reflected light beam of the first resulting in an interference pattern that is recorded on film. The encoded image has a very chaotic non-descript appearance that can resemble the surface of the moon with multiple crater sites. The image has no resemblance to the object that it will be used to recreate. Again it is important to emphasize that if the photographic plate is broken into many fragments each can still be used by itself to recreate the entire three-dimensional object no matter how small the fragment being used.

The brain functions as if it was accessing a holographic plate with encoded images. This has been well established in both lower animals and humans. Karl Lashley surgically removed various portions of rat brains and submitted them to experimental testing both before and after. He determined that no matter what portions of their brains he removed he could not erase their memories. Their motor skills were often impaired but even with large portions of their brains removed, they could still find their way through a maze.

Paul Pietsch performed similar experiments on salamanders. In a series of 700 operations he performed multiple different types of surgical extractions of brain tissue including flipping, subtraction, and even mincing, but always when he replaced what was left of their brains their behavior returned to normal. Humans following removal of sections of their temporal lobes, which supposedly is very important to memory function, may also retain normal function.

Other examples could be presented illustrating the holographic operation of brain function. There are an increasing number of mind-brain

researchers who accept this concept but at present remain in the minority. Virtually all mental events can be explained by the holographic model. It would seem that the actual storage of information occurs more within the space-time arena than the matter-energy (hard-wiring) portion.

Carl Jung became convinced that a collective unconsciousness exists that all humans contribute to and can access. He concluded that dreams, hallucinations, myths, and religious visions derived from this collective unconsciousness. If such an unconsciousness exists, and I believe that it does, its memory would be holographically recorded in space-time.

Mystics and other individuals who have reported experiencing omniscient cosmic oneness with the universe, where there is a total loss of ones individual boundary along with the sense of unity with all life as well as the perception that one is in complete total unity with the entire universe, are likely tapping into a larger volume of the space-time hologram.

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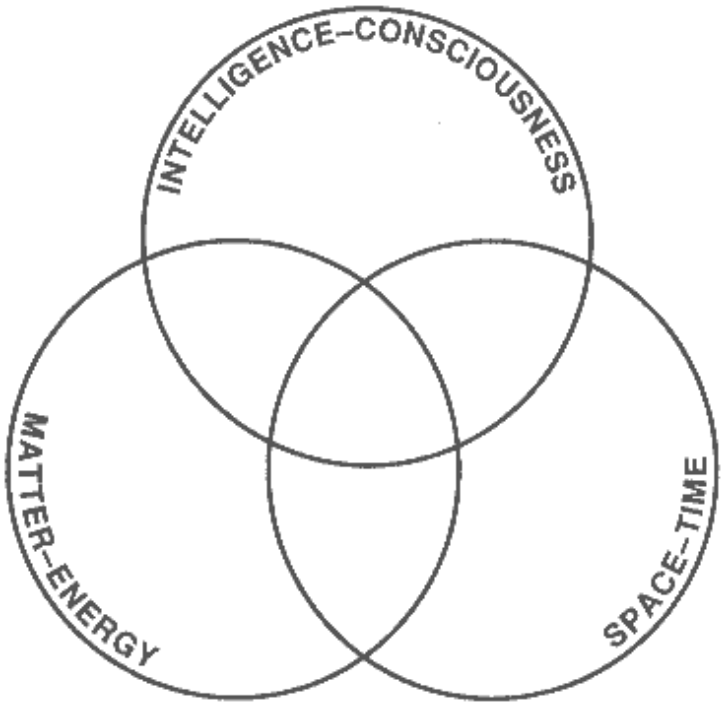
Integrated Theory of Intelligence



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Roger D. Blomquist, M.D.

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Ask Questions/Comments

Suggested Reading

Purchase the Book "Integrated Theory of Intelligence"

Purchase Dr. Blomquist's Jazz Album for Charity

About the Author

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Preface

Origin of Theory

Part I

The material contained within this book represents a relatively comprehensive view of intelligence and consciousness, and the way that both relate to the rest of our material existence. It has been stated in such a way as to hopefully allow widespread reading and understanding by anyone who has an interest in the subject.

This book was written by an individual who metaphorically was entirely left-brained until the age of 45 years. He had a precise logical, analytical mind with very little imaginative ability. This does not imply any outstanding ability as a left-brained person, but rather admits to a deficiency in the right-brain domain, including a general lack of creativity, intuition and spiritual involvement. A peak experience resulted in the sudden awareness of certain mental attributes usually associated with the right brain, and stimulated the writing of this book.

The concepts discussed in this book have been unconsciously directed toward the left-brained scientist who has not discovered his right-brain potential and is therefore incapable of utilizing this latent ability. There is an overwhelming, justifiable tendency to deny the experiencing of supraconsciousness states until one has been there. This book is offered as evidence that new scientific theories and higher-order concepts can be generated through peak experience, thus accelerating the rate at which knowledge is accumulated and reality is understood.

The long-term goal is to study peak experience and validate the claim that it can be the source of higher-level understanding as well as the source of new insight to potentially anyone, including the research scientist.

Although peak experience has been a supraconsciousness state that has occurred sporadically, and more by accident than design until recently, it is now becoming apparent that there may indeed be ways to facilitate its onset. I hope this book will generate more interest by the scientific community in studying this phenomenon and finding ways to tap its unlimited potential.

To some, the material in this book will appear redundant and simplistic and to others it will be difficult to comprehend. It was written to the physicist who knows little about biology, paleontology and genetics, and to the biologist who knows little about physics, cosmology and psychology. Most scientists know a great deal about their own field but not too much about any other. What is obvious to some requires much detail and description to convince others.

One central theme of this book advocates that everything within the universe is interrelated. Our challenge is to define those interdependencies, and particularly to show how intelligence and consciousness intertwine with matter, energy, space and time. Together they are seen to represent the basic fabric of the universe. If in fact intelligence is one of the basic ingredients of the universe, then there must be many mathematical relationships that relate intelligence to matter, energy, space and time, just as the latter four have relative to each other. An attempt will be made to define a few of those mathematical relationships that I am convinced exist.

Another central premise of the theory suggests that the way intelligence manifests itself relative to material existence has evolved exponentially over time and will continue to do so hereafter, even though cultural evolution has modified or even impeded those factors which have traditionally helped to select out the more intelligent. Evidence will be

cited which supports the viewpoint that intelligence is continually achieving levels of greater complexity, thus resulting in the attainment of higher states of consciousness (i.e., peak experience).

Twenty-four properties of intelligence are postulated and examined in the light of current scientific understanding. This represents the major part of the text.

The evolution of intelligence and consciousness will be related to the entropic process of matter-energy and the expansion of space-time, all of which are interdependent and occurring exponentially.

It is suggested that consciousness is the single most important basic property of intelligence, although there are many who would argue that it should be the other way around and that intelligence is actually a function of consciousness. This is meaningless, however, since the essence of our existence has both consciousness and intelligence, and at least at the human level of experience one cannot exist without the other. Mind cannot be conscious without being intelligent and likewise it cannot be intelligent without being conscious. It is like trying to decide whether a photon is a particle or wave. This text could have been entitled the "Integrated Theory of Consciousness" and written in such a way that intelligence is defined in terms of consciousness. An arbitrary choice was required.

Consciousness is examined as it exists in both its most common ordinary state as well as in other altered states. It is also argued that states of supraconsciousness are potentially obtainable by almost anyone, which can lead to the creation of higher-order concepts and a greater understanding of reality. This in turn can result in greater happiness and serenity as well as the loss of neurotic symptoms when present.

The book attempts to illustrate how original concepts are generated in our intuitive unconscious mind to then be processed by our logical, analytical, conscious mind. Both processes are essential to the gaining and understanding of new truths.

Although the book does not directly address the spiritual aspect of our existence, it attempts to lay the groundwork for those individuals who require scientific validation of their spiritual beliefs.

The final chapter discusses the implication of what the continued evolution of intelligence and consciousness means to humankind and how it will impact our future. Suggestions will be presented to show how a formal organization might evolve incorporating the "Aquarian Conspirators" or Maslow's "growing tip," which in time could dramatically affect humankind.

We have evolved to the state where one can take an active part in increasing their level of intelligence as well as achieving higher states of consciousness. This in turn can aid humankind in restructuring its world view and greatly improve our chance for survival. This book attempts to add new material to this emerging cosmic story. It is both surprising and exciting to find that our evolving world view is an extension of prior beliefs. Some stories of creation based upon mythology were amazingly accurate, although incomplete, when viewed through our more sophisticated scientific perspective. Science has gone a long way toward validating humankind's intuitive spiritual insights. When similar concepts are generated from two seemingly different disciplines of opposite polarity, such as science and spirituality, this I believe gives greater credibility to those concepts than either discipline would achieve on its own.

This text represents the fourth edition of the *Integrated Theory of Intelligence*. The first was completed in 1984. The present edition is much more elaborate than the first; however, it is essentially unchanged in basic concept. The present edition was written as an attempt to respond to various criticisms made by certain individuals who have already been acknowledged. I will now begin working on the fifth edition as I receive additional feedback from all those who take the time to respond.

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Preface

Part II

Hypothesis: Peak experience can result in extraordinary insights into reality and can also be the source of breakthroughs in the generation of innovative scientific concepts.

If this hypothesis is proven to be true, then it potentially becomes one of the single most important discoveries of all time. I am convinced that it is true and offer what I believe to be valid evidence to support this claim. For the past seven years I have been working on this book, which contains certain theories that originated from a peak experience. The theories are being offered to the scientific community for either verification or nullification, and therefore serve as a test of the hypothesis presented above. If over time the Integrated Theory of Intelligence is validated, then it becomes strong evidence to support this hypothesis. This in fact is why the book was written.

The strategy employed has included writing as complete a general theory as possible, one that is both creative and far-reaching, and even perhaps somewhat revolutionary. Some of the concepts presented will reach considerably farther than is presently justified by existing scientific evidence. If the concepts are verified over time, as were Einstein's theories on relativity, then the hypothesis presented above has strong evidence to support it. The more bold and imaginative the theory being tested, the greater the chance for error. Conversely, if it is

eventually verified as true, then it stands as stronger evidence in support of the hypothesis.

The concepts presented in the Integrated Theory of Intelligence were mostly obtained from the peak experience (P.E.). Some of the thoughts conveyed were already part of my own information system, but during the P.E. they were integrated into a completely new concept of reality. Many of the concepts, although new to me, had already been scientifically validated, though I had no conscious awareness nor understanding of them at the time. It was only after the event that I began searching the literature for verification of my newly acquired insight. As much as possible this has been woven into the text in support of each conclusion. The important point is that even though much of the information contained within the theory was already known or suspected in bits and pieces (to myself as well as various other individuals), I had no conscious knowledge or understanding of most of it before the P.E.

A definition and discussion of P.E. will be presented and examples given of others who have generated scientific concepts following probable peak experiences. P.E. has best been defined and studied by Dr. Abraham Maslow, former president of the American Psychological Association and one of the most important leaders of "third-force" or "humanistic psychology." (Ref. 1) It is basically Dr. Maslow's definition of P.E. that is being used throughout this work, since his description best fits my own experience.

P.E. represents one of at least several altered states of consciousness and might be referred to as a transient state of supraconsciousness. It is a relatively common occurrence and one poll indicates that over one-third of all individuals claim to have had one. (Ref. 2) Maslow first discovered what he called "peak experiences" in self-actualizing individuals; however, it gradually became apparent to him that a great many people have them. (Ref. 3) He believed that so-called "mystical experiences" were essentially the same thing as P.E. (Ref. 4) I believe that they are the

same, but prefer the term P.E. because of the lack of supernaturalness implied by the latter. P.E. is also a phenomenon which has been evaluated scientifically, and should be readily accepted by many to represent a valid altered state of consciousness, with only its source remaining in question.

Maslow concluded that during a P.E. people have a better, truer perception of reality. During this altered state an individual achieves the same insights that many philosophers have had regarding the unifying aspects of reality. (Ref. 5) Some of the words he compiled which are common to P.E. include truth, beauty, joy, ecstasy, wholeness, dichotomy-transcendence, perfection, order, simplicity, uniqueness, justice and completion. (Ref. 6)

Briefly stated, Maslow describes the major features of a peak experience in the following way, which also should again be noted as paralleled by my own experience. One has the perception that the universe is a totally integrated and unified whole and that one is a part of it. A "cosmic consciousness" is experienced so that the whole cosmos is perceived as a unity and one's own place in this whole is simultaneously understood. Self boundaries are lost as one becomes integrated with the rest of existence; however, self-identity and individual awareness persist.

During a P.E. one's concentration is totally absorbed and there is the truest and most total kind of visual perceiving or listening or feeling. One experiences superhuman, almost "god-like" perception of apparent reality. There is a feeling of omniscience. Great insights and revelations are achieved and profoundly felt, associated with feelings of intense joy and ecstasy. The experience alters one's perception of the meaning and value of life, and makes life seem much more important and worthwhile. There is a time and space disorientation so that the ability to estimate a time interval is lost.

The dichotomies, polarities and conflicts of life are transcended and resolved. The world is seen only as a beautiful, good, desirable place to

be. It is never experienced as evil. The presence of evil is accepted and understood as part of the whole--as being unavoidable and necessary. During the omniscient perceptive state, evil is seen as a product of limited or selfish vision and understanding. The greater the understanding, the less the condemnation or blame, disappointment and shock that will be experienced. There is a transient loss of all anxiety, fear, confusion, conflict and inhibition. It produces the long-lasting effect of one becoming more loving, honest, innocent, non-needing, less selfish, and even more god-like. One is left with an all-embracing love for everybody and everything, which in turn leads to a strong impulse (drive) to do something good for the world. There is an eagerness to repay the peak experience with a sense of obligation and dedication to humanity. The best verbal description of a P.E. is not nearly good enough, since words cannot begin to capture the essence of the experience. (Ref. 7)

Although he did not recognize it as such at the time, I believe that the German chemist, August Kekule, had a mini-P.E. when he had an intuitive flash while in a dream-like state that led to his realization that the benzene molecule has a ring-like structure. This was a real conceptual breakthrough within the field of chemistry. According to Kekule, this realization occurred during a "Halbschlaf" state, which translates as "half-sleep" or "reverie." (Ref. 8)

I believe that the Book of Genesis originated from a peak experience. It represents an extraordinary effort at explaining the origin of the universe, which although not completely accurate by today's level of comprehension, is nevertheless roughly correct in describing the sequence of events as we now understand them. There can be no doubt that even today's most sophisticated description of our origin and evolution is only approximately correct and will be continuously modified and updated as our understanding of reality improves.

There are many reports of creative acts that have apparently occurred during altered states of consciousness, thus supporting the commonly

held notion that altered states allow the unconscious process to operate more freely. Harman and Rheingold, after researching case histories of scientists, "found that not only many specific scientific discoveries but the very foundations of science itself were built on breakthrough experiences, later backed up by empirical investigation." (Ref. 9) They give many examples throughout their book Higher Creativity. One example makes reference to three dreams that Rene Descartes described in detail, which occurred on November 10, 1619. These dreams literally changed his life, as well as all of history, by giving a clear method to science. In his dreams he saw himself as a person destined to reform knowledge, unify the sciences, and search for truth as his career. He gained the insight that "all the sciences are interconnected as by a chain; no one of them can be completely grasped without taking in the whole encyclopedia at once." A major part of our present world-orientation stems from that moment. Descartes' revelation was gained during an altered state of consciousness, and it is ironic that it came through the hidden or ignored route of nonrational supraconsciousness or inner knowing, since it resulted in our present scientific method which is built upon an empirical, reductionist, positivistic viewpoint. (Ref. 10)
Astronaut Edgar Mitchell, while returning to Earth from his Apollo 14 moonwalk, stated, "In a peak experience, the presence of divinity became almost palpable and I knew that life in the universe was not just an accident based on random processes. The knowledge came to me directly-noetically. It was not a matter of discursive reasoning or logical abstraction. It was an experiential cognition. It was knowledge gained through private subjective awareness, but it was--and still is--every bit as real as the objective data upon which, say the navigational program or the communications systems were based." (Ref. 11)

I will describe my own perception of peak experience as accurately as language will permit, since I believe that over time it needs to be, and can be, verified as a way to achieve higher-order understanding of reality. Concepts derived and proven by science certainly further define reality. The source of new concepts, which constantly feed science,

requires much further exploration, since by better understanding the source we can hopefully better tap its potential.

To verbally describe P.E. is actually next to impossible except to another individual who has already had one; nevertheless, an ambitious attempt will be made. Anyone who has experienced one will readily say that it is indescribable in much the same way that a near-death experience cannot be verbally expressed.

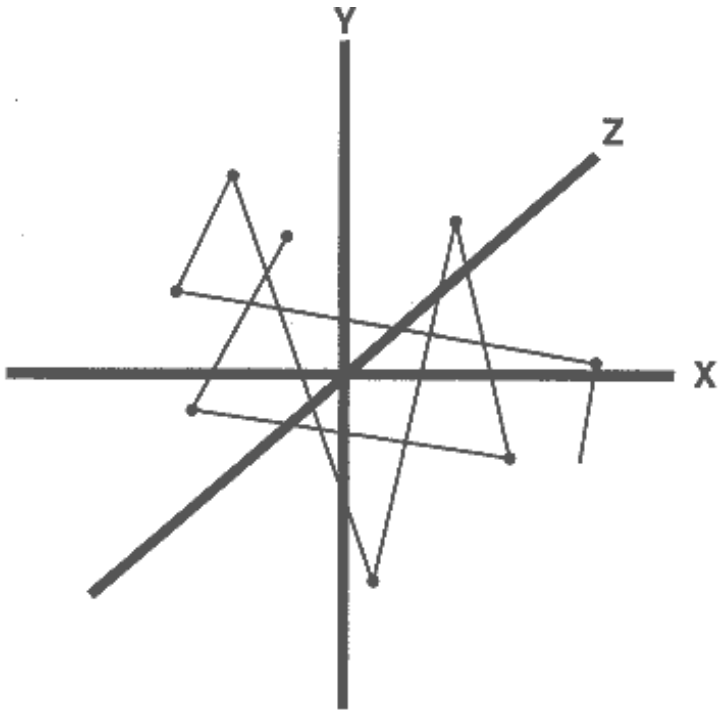
This same problem exists when one attempts to translate information gained during a P.E. to another person. Even though one's level of understanding is perceived to be omniscient during P.E., and by relative comparison to one's ordinary state of consciousness most certainly is, at least two things occur which restrict one's ability to accurately transcribe any new insight gained.

(1) Within a very short period of time amnesia begins to erode the memories of the experience from consciousness. The amount of new information that is temporarily held at the conscious level is literally awesome, but cannot be maintained for long. It also becomes distorted by previously stored memories and biases as the amnesia progresses. Every P.E. that has been experienced throughout recorded history, including this one of mine, has been subjected to the biases of the peaker during the recording of the event. Although the information that one is subjected to during a P.E. may be truth in an absolute sense, if the experience is truly omniscient, most of it becomes significantly modified during the recording process even though the individual is trying very hard to accurately transcribe it. Following a P.E. and the return to an ordinary consciousness state, one is able to recall to consciousness only a small fraction of the experience. Some of the information lost by amnesia can be regained through a process of meditation, but this requires intense effort on the part of the individual.

(2) The second thing that restricts the transcription of new information gained during P.E. is the total inadequacy of language.

The experience itself is not conducive to verbal expression. The P.E. itself is essentially nonverbal and cannot be conveyed to others by the use of written or spoken words. In using language each thought has to be individually coded by the writer or speaker in a linear, sequential fashion (one after another), and that will be exactly how the recipient receives it. During P.E., however, all thoughts are linked or totally integrated so that one's mind is not working linearly. Metaphorically speaking, a P.E. is a four-dimensional experience that we are trying to describe with a three-dimensional language.

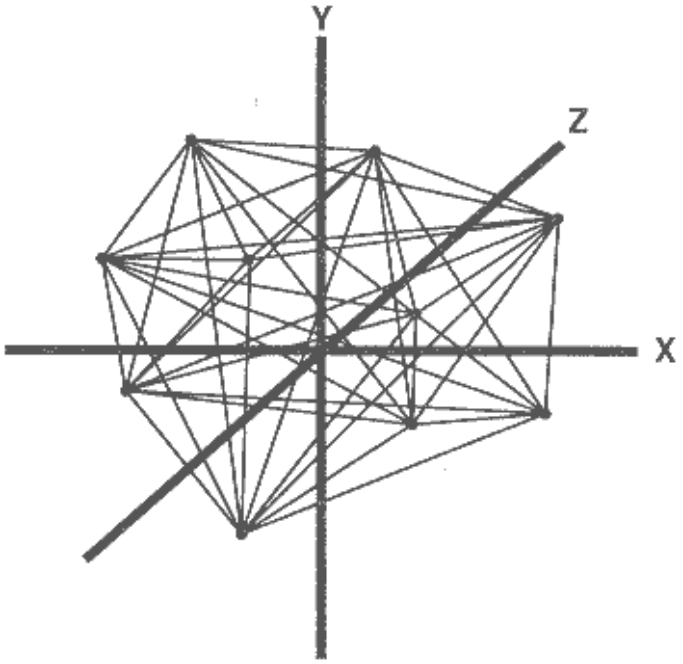
These concepts might be illustrated diagrammatically.



Linear Thinking
During Ordinary Consciousness

Each dot above represents a separate thought or meme. Our minds seem to move from one thought to the next in sequential fashion during ordinary consciousness. Our minds can only hold a single thought at a time. A new creative thought occurs whenever two or more previously

recorded memories, memes, or thoughts are simultaneously combined.



Higher-Dimensional
Thought Processing During P.E.

During the omniscient experience, all thoughts that are usually occurring in linear sequential fashion are totally integrated and are processed simultaneously, thus giving one a global perception of reality. Rather than traveling from one dot (thought) to the next, they are all connected or experienced simultaneously. The higher the level of consciousness, the more individual thoughts (memes) that are being processed simultaneously per unit of time.

The description which follows was primarily obtained through a process of introspection requiring many hours of meditation over a several-year period of time. This was begun shortly after the peak experience.

Until I read Abraham Maslow's description of P.E., I had no name to apply to my extraordinary experience. It was immediately very obvious to me that his description of P.E. was exactly what I had experienced, to

the extent that I felt I knew what he was going to say before he stated it. I would add to his description and interpretation, hopefully giving a fresh perspective to the information that is already known.

It is my perception that during P.E. all bodily sensing devices (visual, auditory, tactile, olfactory, taste, etc.) seem to be considerably more sensitive than during an ordinary state of consciousness and would be capable of hyper responsiveness; however, they are being effectively turned off. This is at least in part because of the intensely forced meditative state that one is in during P.E., which tunes out the conscious registration of incoming stimuli. In theory this opens up a greater number of electrochemical circuits and reduces noise in the system, resulting in a tremendously enhanced information processing ability. This therefore helps facilitate a state of supraconsciousness or hyperawareness. This process also contributes to the sensation of separation of mind from body, since the constant operation of all sensory apparatus during an ordinary consciousness state partially accounts for much of our body awareness.

At the same time, the body musculature is in a state of complete and total relaxation that also contributes toward the elimination of nerve impulses competing for electrochemical circuits, again reducing noise within the central nervous system. This also aids in the perception of the mind being separated from the body, since part of our body awareness is the result of muscle tension. Both the tuning out of body sensory devices and the complete relaxation of all musculature facilitate the supraconsciousness state, and the perception that the mind is separated from the body.

The elimination of all body sensations accounts for much of the perceived experience of pure consciousness, but probably does not totally explain it, since in addition to the loss of body sensation one also has an extraordinarily strong feeling of oneness with all of the universe. One is not just perceiving oneself to be an isolated focus of self-awareness, which an individual might arguably feel if separated from

one's body, but one perceives oneself to be an essential part of a much greater whole without any separation from the rest of existence.

There is a strong feeling of omniscience. Every question posed has a complete and immediate answer that is totally satisfying. There are no longer any dichotomies or contradictions. One would seem to have access to virtually all previously stored information (memories) within both the conscious and unconscious mind, whether learned or genetically transmitted. This is most probably explained by an enhanced ability of the mind to process much more information simultaneously than when experiencing ordinary consciousness. The higher the level of supraconsciousness state, the more information that is being simultaneously processed within the mind.

Level of Consciousness = (units of information processed/time)(K_1)

K_1 = constant, yet to be defined.

This results in a hyperawareness state that is both introspective and extrospective. (One has a greater awareness of information that relates to "self" as well as information that relates to "non-self.") It would also appear that the greater the ratio of true information stored to false information stored, the more closely any new higher-order concept will approximate reality.

Creative potential is dramatically amplified during P.E., thus leading to the generation of higher-order concepts as well as enhanced artistic expression. This again reflects, at least in part, the mind's ability to process more information per unit of time.

During lesser states of supraconsciousness below the level of a P.E., all feelings are amplified. A telephone ring will cause a more intense startle reaction than during an ordinary state of consciousness. Mild fear can

become paranoia. A feeling of happiness can become euphoria. The intensified feelings are similar to those of childhood. The experiencing of supraconsciousness states leads me to conclude that there is a loss of intensity of all feelings with aging that is so insidiously slow that one is not aware of it. During a full peak experience there is a feeling of intense euphoria without any feeling of fear or paranoia. Intense joy or ecstasy, along with a great love for anything and everything, are the only feelings experienced.

P.E. can be a deeply felt spiritual experience which others have referred to as mystical. I dislike the latter term because it implies a supernatural event, whereas P.E., even though it is extraordinary, is thought to be a natural phenomenon. It is experienced as "spiritual," at least in part, because one is left with a new and sudden insight well beyond anything previously accepted as truth. One's new level of understanding is perceived as a gift which suddenly springs forth from some external source not previously being part of self. It is also a spiritual experience from the standpoint that one feels much more intensely conscious and has the greatly heightened feeling that there is definitely a meaning and purpose to life.

There is the very strong perception that the universe and all of existence was no accident, but rather the result of an immense grand design. One is also left with a much stronger desire to do good for all other people, as well as all life forms. One is left with no doubt that we have the power to exert will and that we do have at least some control over our own existence, including our own behavior.

The concept of free agency is seen more in perspective so that one better understands the interrelationship between self and the environment. Even though each of us does exercise free agency, we are also being constantly challenged, influenced and buffeted by our surrounding environment, sometimes beyond any control that we might wish to exercise.

Jesus, Buddha, Mohammed and others all had similar episodes of enlightenment that suddenly brought forth new levels of understanding which literally changed the direction of their respective cultures. Each of them in their own individual ways crystallized certain universal thoughts which resulted in improved individual and group behavior. Each expressed concepts about love, giving, humility, forgiveness, sharing, perfection and other values that dramatically enhanced humankind's survival potential. I submit that each of these spiritual leaders had one or more peak experiences that gave them a more accurate perception of reality relative to the perceptions of others living at their various times. Identifying their respective experiences as peak experiences in no way detracts from their profoundness. They each achieved new insights into what types of necessary behavior would be required of each of us as individuals if humankind were to survive into the future.

P.E. might also be considered spiritual in the sense that the impact is so exceedingly strong and deeply felt that it leaves a very long-lasting impression upon one's memory. Such attitudes as wonder, awe, reverence, humility, surrender and even worship have been reported. It parallels the "near-death experience" and makes acceptance of death easy or even happy. It can result in a dramatic change in the direction of one's life thereafter. It also strongly impacts one's value system, resulting in a more group or society-oriented behavior that is more altruistic, ethical and humanistic. Our greatest spiritual leaders were all affected in this manner.

The total serenity of P.E. is so incredibly euphoric and desirable that it is itself an ultimate reward for achieving it. Once you have been there you wish that you could always stay there. The perception that one is left with is that if everyone were living in this state there would be no hate, hostility, aggression or war, only love, peace and total understanding of everyone and everything.

The higher-order concepts and vastly increased understanding of reality that I achieved during P.E. very closely paralleled all of the basic

information already stored in my mind. It seemed to produce a synthesis of new insight, building upon concepts previously learned relative to my own mind, which was very heavily influenced by my level of scientific understanding, spiritual beliefs, philosophical bias, as well as all other information locked inside my unconscious mind. Suddenly all of my previously stored conscious and unconscious information merged together in such a fashion that it resulted in a new, higher level of comprehension and understanding of reality. It all made total and complete sense without any contradictions or dichotomies. All questions were answered. For several hours afterward I had the perception that I had understood virtually all answers to all questions. This extended into the early daylight hours of the following morning. This was accompanied by the most profound feeling of peace and tranquility.

As the day progressed, amnesia began to erode the greatly heightened level of understanding achieved during the P.E. The loss of insight from conscious memory over the next several days seemed to follow an exponential decay curve. Within 48 hours, well over 90% of the new information seemed to be lost from conscious memory. The experience was so undeniably strong, however, that I was left with the knowledge that the insights were still there, hidden somewhere in unconscious memory, and I was very strongly motivated to attempt to retrieve them.

A fraction of the insight has been regained through many hours of meditation and study. Even though I gained many new concepts and a more full and complete understanding of reality during the P.E., I have since found that many of the thoughts had not only been brought forth by other individuals previously, but that many had also been scientifically established by mind-brain researchers. This has provided whatever proof I needed to convince myself that P.E. is a valid way of achieving breakthroughs in scientific understanding. What others had been struggling to verify experimentally for years, I came across during one sudden intuitive leap. Not all of the concepts put forth within the Integrated Theory of Intelligence have yet been validated through

scientific research. However, knowing that many already have been has increased my confidence that eventually others will be also.

One question that I am trying to satisfactorily answer is: Where in space is the information stored that my mind has access to during an ordinary state of consciousness, and where in space is the additional information stored that my mind becomes privy to during P.E.? Is the information stored in space all around me, so that an expanded state of supraconsciousness allows me to integrate, canvas or observe a larger share of it? Does the total amount of stored information that I have access to during P.E. entirely belong to me, or is some of it shared with others at a colonial hierarchy level? Although the new insights seem to build upon information already stored within my conscious and unconscious mind, I cannot rule out the possibility that the new information was being retrieved from an external source. The most probable explanation would seem to be that there is information stored within a universal holographic system, that it is potentially available to anyone, and that the higher one's level of consciousness, the more information that becomes available to consciousness for processing.

This concept might be illustrated by evaluating a photographic image stored on a holographic plate. If the whole plate is utilized in the restoration of the holographic image, it will be relatively high in resolution and detail. If, however, the plate is broken into multiple pieces of varying size, any reconstructed image will have less resolution and detail, dependent upon the size of the broken fragment that is used in the reconstruction process. All images will show the same structures, but the detail and resolution will vary greatly. If our minds operate on this principle, one might speculate that the greater the level of consciousness being experienced, the larger the volume of the universal hologram being processed by the mind per unit of time.

Another concept that appears to be quite probably correct is that the more carefully one has programmed the mind with correct factual information, the more accurate and far-reaching will be any new insights

that are gained through P.E. One's newly gained perception of reality will at least in part be based on previously accepted beliefs. The

following mathematical expression would seem valid:

L.E. ∝* T.A.R.T.

L.E. = Level of Enlightenment (gained during P.E.)

T.A.R.T. = Total amount of relative truths previously programmed into the mind whether scientific, spiritual, philosophic or genetically transmitted.

***∝- This symbol, used here and elsewhere, means "is proportional to."**

One might similarly state:

Reliability Quotient **= (T.I./F.I.) (E.I.) (C.L.)**

Reliability Quotient = Probability of correctness of any intuitively derived thought or concept.
TI = Total amount of stored true information.
FI = Total amount of stored false information.
EI = (Effort Intensity) level of effort applied while seeking truth.
CL = Level of consciousness (supraconsciousness).

In other words, the more truth (both conscious and unconscious) you already know, the greater the chance that any choices based on intuition will be correct. The more truthful and honest one is during the assessment of any situation or event, the greater the chance that conclusions drawn or actions performed on the basis of intuition will be

the best choices. Prior to the P.E. I was much less trusting of intuition than I have become since the P.E. I have learned to trust and rely heavily on intuition. It would seem that when motivation and behavior are based on the premise of doing the right thing for the right reason, then intuitive decisions are almost always correct.

Another major paradigm shift occurred for me as the result of the P.E. Prior to the P.E. all visual images that I would see in my "mind's eye" (eyes shut) would be similar in structure to any visual images that I would see when my eyes were open. All visual images conformed to my usual visual field of view, and would be perceptually located out in front of my body. During ordinary consciousness, visual images stored in memory were perceived as quite vague, indistinct and lacking in detail, even though they could be quite lifelike with much detail during a dream state.

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During the P.E. there was a sudden onset of an entirely new visual imagery never before experienced by me. It was more like a four–dimensional hologram. I was no longer a separate outside observer looking at an external event, but rather I became a part of the image, being totally enveloped by it. I perceived myself to be at the core. Visual images were very clear, detailed, complex, sharply in focus with high resolution and in color, yet somewhat airy or ghost-like in quality. It was four-dimensional in the sense that images occurred in real time (motion) in an expanding space. The content of the images was dependent to a great extent upon my thought processes. Any question that I posed was answered, at least in part, with a holographic-like visual image. It seemed that all stored memories both conscious and unconscious were being integrated to produce a complete understanding of anything and everything.

It is not overstating the perception to say that I felt totally omniscient. It was also my perception that this universal holographic image was essentially complete in all details, and that whenever there was any change in the direction of my thought process, the image itself didn't change as much as did my focus of attention onto some particular aspect of the holographic image. I could mentally zoom in a microscopic or macroscopic direction at will. The entire omniscient experience was much more than visual, but this aspect of it did comprise a significant part of the total.

Over time I have evolved in my mind a visual model of the universe that best fits all of the information that I have stored in my conscious and unconscious mind. I alter the image as new information is processed. It is one single image that extends from the microscopic (quantum) to the macroscopic level.

The peak experience has resulted in a definite change in my priorities as to what I now consider to be most important. My need to search for truth and achieve a greater understanding of reality has intensified. Since I have had an omniscient experience, I now perceive that there are answers for virtually every question. I now believe that the pursuit of truth as a "Quest in Search of the Theory of Everything" is the most noble of deeds that anyone can perform. This has stimulated me to become more self-actualizing in the tradition addressed by Maslow.

At the risk of sounding self-righteous and self-serving, I will describe several ways in which I perceive a change in myself as a result of the P.E. I now find myself making all major decisions on the basis of what is good for both myself and humankind without excluding either in the process. The best solutions to any problem benefit both the individual as well as their society. I have become more tolerant of human imperfection and am less quick to become angry when others fall short of my expectation. Although I have always found aggression, terrorism and war distasteful, I have become adamant in my belief that all conflicts must be settled by peaceful negotiation, whether on an individual or global level. I perceive myself to be a more loving, caring, altruistic person relative to what I was before. I have lost virtually all fear of death and now view it as a new adventure, if not the ultimate experience. I am also left with the impression that anyone who has a P.E. will be affected in similar fashion. If P.E. could be bottled and sold, the planet would be transformed into a much better place. During my more optimistic periods, I like to believe that a peaceful planet arrived at through more and more individuals achieving higher states of consciousness could conceivably be humankind's greater destiny.

The P.E. has continued to provide me with a strong motivation to pursue and understand the meaning of the experience. I was motivated to write this book. I have been continually motivated to attempt to achieve transient periods of supraconsciousness, during which I continually seem to improve my understanding of reality. The more I learn, the

more I want to know. It is my belief that our collective understanding and description of reality is increasing exponentially, and will continue to do so in the future.

I embarked upon this project because I am now convinced that the attainment of a P.E. is the most important single experience that anyone might ever achieve. Through the knowledge of how it has impacted my life, I must assume that others would be affected similarly. It has changed my priorities as well as my behavior, so that I am much more society-oriented. I feel compelled to establish myself as part of lifekind's solution rather than living as part of its problem.

It is my perception that over time there will be increasing numbers of individuals who will have a P.E. and will be motivated to act more positively toward the preservation and improvement of humankind. In fact this shift has already begun. A book has recently been written by Yatri, who, I believe, unquestionably had a peak experience. The book is entitled Unknown Man: The Mysterious Birth of a New Species. The information contained in his book, including the description of the event which led to its generation, establishes this fact. Although the content of his book is different from mine, his conclusions are very similar. He traces the evolution of humankind, and sees beings of higher consciousness developing. He clearly understands that there is an underlying unity and interrelationship of all things. It is apparent that the P.E. completely changed his perception of reality, which in turn has resulted in a change of behavior. He was motivated to write a book that is designed to help improve humankind's chance of survival. He is extraordinarily well enlightened in the understanding of many scientific, spiritual and philosophical concepts, even though he describes himself as an agnostic sculptor at the time of his P.E. (Ref. 12)

John Weir Perry also has stated that it was during a "peak experience" as defined by Maslow, that, "I perceived that the thrust of evolution toward higher levels of order and complexity was now pointing toward its next

phase, the creation of a new superorganism. I saw that if the highest achievement of this creative process so far has been the extraordinary configuration of energies that form mankind's consciousness, then surely the next step is that of bringing together the individual psyches into an organic whole, which I saw as the `social organism'... The gift of this vision of creation I not only treasured; I found it my vocation. This was to explore the dynamics of social and psychic evolution, and I hoped, to reach some comprehension of how it could be that society might become increasingly such an organism whose members lived cooperatively for the well-being of the whole. My question was that if this is indeed our evolution's next level of order and complexity, where in the human psyche would the dynamics originate that might motivate individuals toward furthering such a future?" (Ref. 13)

Richard M. Bucke, M.D., in his book Cosmic Consciousness, first published in 1901, described his own supraconsciousness experience, which he had in the spring of 1872. He is the first scientifically oriented individual I am aware of who described his experience in some detail. The description fulfills Maslow's criteria of a peak experience, a term not to be defined until several decades later. His experience closely paralleled my own, with the exception that I did not observe the bright light that he and others have mentioned.

Bucke determined that cosmic consciousness most often occurs between the ages of 30 to 40 years. It produces a permanent purifying, strengthening and exalting effect, with a general increase in spiritual level that lasts for the rest of one's life.

He described cosmic consciousness as follows: "The person, suddenly, without warning, has a sense of being immersed in a flame, or rose-colored cloud, or perhaps rather a sense that the mind is itself filled with a cloud or haze.... [H]e is...bathed in an emotion of joy, assurance, triumph, `salvation.'" There is an "ecstasy, far beyond any that belongs to the merely self-conscious life.... There is an intellectual illumination

quite impossible to describe. Like a flash there is presented to his consciousness a clear conception (a vision) in outline of the meaning and drift of the universe.... [H]e sees and knows that the cosmos, which to the self-conscious mind seems made up of dead matter, is in fact far otherwise--is in very truth a living presence.... He sees that the life which is in man is eternal, as all life is eternal; that the soul of man is as immortal as God is; that the universe is so built and ordered that without any peradventure all things work together for the good of each and all; that the foundation principle of the world is what we call love, and that the happiness of every individual is in the long run absolutely certain. The person...will learn in the few minutes, or even moments, of its continuance more than in months or years of study,... especially does he obtain such a conception of THE WHOLE...." One develops a sense of immortality, loses any fear of death, and also loses the sense of sin. (Ref. 14)

Bucke indicated that this supraconsciousness state would appear more and more frequently until it became a regular attribute of adult humanity. This state represented the next level of higher consciousness in our evolutionary ascent. (Ref. 15) He believed that the human race was developing a "new kind of consciousness, far in advance of the ordinary human consciousness, which will eventually lift the race above and beyond all the fears and ignorances, the brutalities and bestialities which beset it today". (Ref. 16) He concluded that the "growth, evolution, development...has...always gone on, is going on now, and...will always go on". (Ref. 17)

Following his supraconsciousness experience, he spent years researching other individuals whom he concluded had also had similar transformational experiences. He believed that he had identified at least 14 such people, most of whom are famous, including Gautama (Buddha), Jesus, Paul, Plotinus, Mohammed, Dante, Francis Bacon, Walt Whitman and others. His book offers the supporting evidence of these conclusions.

It would seem that Perry, Yatri, Bucke and myself share certain concepts which appear to represent a common perspective gained through peak experience. These concepts would at least include the following:

(1) Humankind is continuing to evolve toward higher levels of order and complexity resulting in increasing consciousness.

(2) Attainment of P.E. results in a strong motivation to work for the betterment of humankind, and improvement of the world's future.

(3) There is recognition of an inner need to explore the dynamics of social and psychic evolution that aid humankind's development, satisfy one's own curiosity and further personal growth.

I have no doubt that over time more books will be generated by individuals who will have had a peak experience, and that they will be identified by the words that they write. In time there will be enough of these people to affect an overall change in perspective of our reality. Even now there are a great many people who understand the need for a major change in direction if humankind is to survive, and they are working to accomplish this. A greater global consciousness is beginning to break down the barriers between different political systems and religious ideologies. A great deal of effort is being made to save our planetary environment. There will be an acceleration of this process over time as our individual and collective consciousness increases. Hopefully this will occur swiftly enough to preclude our self–destruction.

My self-elected task is to search for possible ways to make the achievement of a peak experience a realistic expectation for anyone strongly enough motivated to seek having one. As of now they would appear to be mostly unpredictable random events. However, by better understanding them it may be possible to facilitate their occurrence.

There are those, including Stanislav Grof, who believe that this is already possible.

This book was written as an attempt to give recognition to P.E. and to motivate as many people as possible to study its origin and meaning, and as a result to begin harnessing the unlimited potential that it presents to humankind.

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Chapter 1

Overview of Intelligence Definition

Douglas R. Hofstadter has stated:

> We should try to formulate in some independent way a set of Such characteristics which deserve the name "intelligence." characteristics would constitute the uniform core of intelligence shared by humans. At this point in history we do not yet have a well defined list of those characteristics.... [T]here may be some elegant and beautiful--and perhaps even simple--abstract ways of characterizing the essence of intelligence.... And of course, if contact were established with an alien civilization from another star system, we would feel supported in our belief that our own type of intelligence is not just a fluke, but an example of a basic form which reappears in nature in diverse contexts, like stars and uranium nuclei. This in turn would support the idea of meaning being an inherent property. (Ref. 1.1)

That is mainly what this book is about: a serious attempt to formulate an accurate description of intelligence by identifying its "characteristics" or properties. These properties will be examined from as many different points of view as is possible, and will not only be applied to humans but to all other aspects of our existence where merited. There is an "elegant and beautiful--and perhaps even simple" way to characterize the "essence of intelligence." We will examine the evidence which strongly suggests that "intelligence is not just a fluke," but rather "an example of a basic form which reappears in nature in diverse contexts, like stars and uranium nuclei."

The Integrated Theory of Intelligence represents a relatively comprehensive view of intelligence and consciousness, and the way that both relate to the rest of our material existence. Although the basis of this work originated from a peak experience, as defined by Abraham Maslow, it is being presented within the framework of scientific theory and wishes to be judged from that viewpoint. An attempt has been made to support any philosophical concepts with valid scientific data, at least as much as possible. Certain ideas presented have not yet been scientifically validated, but should in time be testable.

This work should be of greatest interest to those individuals who have experienced altered states of consciousness, have had a peak experience, or consider themselves to be self-actualizing persons, again as defined by Maslow. It is probable that those whose experience fits into one or all of these categories will be among the first to understand and accept the relevance of this work.

The central theme of this book began as a rather lengthy article, but it quickly became apparent that the concepts being presented would require much more discussion and verification than space allowed in the original draft. There was also no discussion about the origin of the theory, which I believe is at least as important as the theory itself. The exclusion of this information was based on a conscious decision because of a concern that this knowledge would bias the reader in their judgment of the theory. However, since the original article was written in 1984, I have encountered in the scientific literature enough discussion of peak experiences and how they might relate to the synthesis of higher-order concepts and enhanced creativity, that I now believe this is essential information and must be shared.

Peak experience has already been discussed in some detail in the preface. It will be correlated with other types of altered states of consciousness and will also give some insight into how the mind works

creatively. Hopefully it will also provide a road map showing how one might actively increase his or her own creative powers. This is the first scientifically oriented theory to my knowledge that is being represented as the outcome of a peak experience.

To have a peak experience is unquestionably the most profound experience that a person can have during their life, with the possible exception of a near-death experience, which is probably very close to being the same thing. Each results in a dramatic transformation of one's life because of the exceedingly strong and compelling impact that it has. I have not had a near-death experience, but descriptions I have read of them reveal similarities to P.E. that are much more profound than the differences. Peak experiences are rather commonplace since many people have now experienced one or more of them. (Ref. 1.2) How does one know if he or she has had a peak experience? The only answer I can give is that if you have to ask yourself that question, then whatever experience you are wondering about wasn't a peak experience. By definition, part of the peak experience is the perception that you were temporarily transformed into a much higher state of being and consciousness. You have not one shred of doubt that it happened and that it was valid. It should also correlate with Maslow's criteria for a peak experience.

P.E. must be evaluated separately and not equated to other "psychic" experiences such as OBE (out-of-body experience), past-life or age regression, ESP, intrauterine memories, and so on, all of which are seriously disputed by scientific research. This does not necessarily rule out the possibility that they are valid--as they are invariably perceived to be by those who experience them--but only that they have not to date withstood scientific scrutiny. Each type of experience must be judged individually on the basis of its content and the information perceived. It should also be stated, however, that the majority of psychic experiences would appear to represent hallucinations, many originating in FPPs (Fantasy-Prone Personalities).

Any individual who has had a psychic experience is invariably absolutely convinced of the reality of the event. It would seem to be as real as anything experienced during ordinary consciousness.

There are alternative explanations which have been suggested for the various types of psychic experiences. For example, it has been found that electrical stimulation of the temporal lobes during neurosurgery can produce dreamy, aura-like effects, deja vu, awe, OBE, extremely lifelike hallucinations, perception of intense meaningfulness, convictions of cosmic consciousness and peak experiences. (Ref. 1.3) There is also evidence that these same types of phenomena might be triggered by "the chemical consequences of personal crisis, anxiety, hypoxia, hypoglycemia, and fatigue." (Persinger, 1983.) (Ref. 1.4)

There would in fact appear to be marked similarities between psychic experiences which can be artificially induced, or caused by certain disease states, and those which have been perceived to be mystical in origin. The question has been posed, how does one differentiate "real transcendence" from the various neuropathies that produce the same extreme realness, profundity, ineffability and sense of cosmic unity? (Ref. 1.5)

In developing the Integrated Theory of Intelligence, I have not so much attempted to establish the ultimate source of P.E. as to determine whether the information, insight and understanding gained is valid.

Prior to my having a peak experience I had never heard the term nor had any knowledge of it. I had read about near-death experiences several years before, but that is as close as I had come. Neither was I familiar with the various altered states of consciousness that one might experience. It was only because of the exceedingly profound effect that the peak experience had upon me that I was stimulated to explain and understand it. To say that it has completely changed my life is not an

overstatement. It has led me in several different directions, not the least of which is the generation of this book.

Soon after having had the peak experience, I described the event as best I could to a friend, Lloyd Campbell, a practicing psychologist. He directed me to the works of Abraham Maslow. I began by reading several of Maslow's books. This in itself was a profound experience in that as I began to read, I felt as if I knew what he was going to say before he said it. There was no doubt in my mind that what I had experienced was exactly what Maslow described. It was also clear to me that the only way he could be so perfect in his eloquence on the subject was that he had experienced at least one P.E. himself.

Although the theory is not yet complete, I believe it to be far enough along at this time for public presentation and scientific scrutiny. Given time, the theory will eventually be expanded by myself and hopefully others. I choose to publish it now to begin the process of debate.

The theory interrelates concepts from virtually every scientific discipline and merges current teachings of many prominent leaders in each field.

Even though my peak experience was something that undeniably occurred, it is still necessary to constantly question the concepts gained. Even though I am now certain that a substantial increase in our knowledge of reality can be obtained in non-scientifically recognized ways, I believe that any new concept still must be scientifically validated to the greatest extent possible. Science in general has tended to ignore the presence of consciousness and how it relates to the more measurable aspects of our material existence. As others have stated more eloquently than I, it is time that all fields of science recognize the existence of intelligence and consciousness, and devise ways to integrate them with our physical concepts.

The greatest challenge I have faced in putting this material together has been to find a way, by means of metaphor and previously established verbal expression, to present each concept in comprehensible fashion. Although much of the beauty of this theory is in its comprehensive nature and the way all parts of it interrelate, the presentation may appear somewhat fragmented. The more understanding the reader already has of the various concepts discussed, the easier it will be to integrate the theory. I have liberally used the words of others in this text and have tried to give credit when due. I chose to do this for two reasons. First, I believe that it gives the work greater credibility; and second, the individual writer often expressed the concept more cogently than I would have been capable of doing. The higher-level understanding that I achieved during the peak experience was totally nonverbal, and I have put forth a great deal of effort to expand my vocabulary for the purpose of expression. Even so, the result remains incomplete. A great deal of the information gained during the peak experience has been lost to conscious memory. Hopefully it still resides in unconscious memory and is yet retrievable. As already indicated, most all of the present text was initially lost to conscious memory, but was brought back very laboriously over an extended period of time through introspective meditation.

Even though a great deal of the understanding that I achieved during the initial peak experience was new to me at the time, in reading the literature it became apparent only a few of the concepts gained are likely pristine. The beauty of the theory lies in the way that the various concepts integrate into the whole, and even more importantly, the way in which the theory was obtained.

I believe that the study of this theory gives science a unique opportunity to validate peak experience as a legitimate means for acquiring creative, insightful, higher-order concepts. There are those who already accept this to be true. Although peak experiences are usually spontaneous, there are apparently a variety of ways which can be utilized to facilitate the

onset of one. If this process can be harnessed, the implications stagger the imagination. It potentially provides a way for the continued non–linear evolution of intelligence and consciousness. It is of utmost importance to determine whether or not higher-order reality concepts not available to ordinary consciousness can in fact be obtained during altered states of consciousness, thus allowing rather ordinary people to achieve extraordinary progress in whatever direction they might choose.

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Chapter 2

Definition of Intelligence (Listing of 24 Properties)

The scientific method as a technique for truth discovery is a relatively recent invention, having been in existence for less than 300 years. Through its rigorous application, a tremendous amount of information and knowledge has been accumulated during the past 20 or 30 decades. Man's ability to do this is unquestionably related to his ability to store and retrieve information, and is a function of his intelligence. The understanding of intelligence and what it represents has been particularly elusive, and thus has to a large extent been ignored within the scientific world. Few deny the existence of intelligence, but yet no one has satisfactorily integrated the concept into scientifically established principles. Most present-day physical scientists see the world within the framework of quantum mechanics and field theory, and traditionally have tried to define the basic ingredients of the universe in terms of matter–energy and space-time, ignoring the existence of intelligence. The biological sciences have also had little room within their basic theories to account for the existence of intelligence, even though most would not deny its existence.

As more information accumulates within all fields of science, there appears to be an ever-growing uneasiness relative to our inability to explain our perception of present-day experience within existing scientific theories. There has been a proliferation of articles and books relative to the mind-body problem and the application of information theory to living systems. There are even those within the physical

sciences who see the need to introduce the concept of consciousness into quantum mechanics and field theory.

The essence of this book is based on the high probability that everything occurring within the universe is interconnected. Our challenge is to define those interrelationships, and particularly how intelligence and consciousness intertwine with matter-energy and space-time. For example, if it could be demonstrated that intelligence is evolving at the same rate that entropy is occurring, or at the same rate that the universe is expanding, then one could argue for the possibility of a mutual interdependency. There is in fact good evidence that all three are occurring non–linearly.

What follows is an attempt to integrate the principles of intelligence with current concepts in all fields of science. There are no well-established principles within any of the scientific fields that will contradict the contents of this integrated theory, and there are a great number of well-established facts to support it.

Definition of Intelligence

Intelligence is a fundamental and primordial ingredient of the universe and exists as a part of its basic fabric. It exists in space but manifests itself through interaction with matter-energy. It permeates all living and non-living matter-energy, and expresses itself in a great number of different ways dependent upon the spatial concentration and distribution of matter-energy. Intelligence is evolving toward increasing complexity and is doing so non-linearly. Matter-energy, intelligence-consciousness and space-time are the only perceived ingredients forming the basic fabric of the universe, and are inseparable, interacting, integral parts, interdependent upon each other.

Intelligence is considered to be present in any system, whether simple or complex, that has the capacity for information storage and integration;

as well as the ability to make decisions consciously, unconsciously, instinctually, or automatically that lead to purposeful action. Intelligence represents a continuum capable of operating on extremely simple or highly complex levels. It permeates the entire universe, manifesting itself at every level of existence. It has a mathematical relationship to information content as well as the entropic process, as first alluded to by Shannon in his Information Theory. Consciousness is the most important basic property of intelligence and manifests itself at many, if not all, levels. Intelligence has other basic properties which can be defined in somewhat the same fashion that one can describe matter-energy or space-time. One purpose of this book will be to give a comprehensive description of intelligence and relate it to the other basic ingredients of the universe.

The relationship of intelligence to matter-energy, space-time, the entropic process, and cosmic expansion will be explored and evidence will be assembled to support certain basic mathematical relationships:

$$\Delta\text{Intelligence} = (\Delta\text{Entropy A})(K_1)$$

This relationship applies to the universe-wide phenomenon where entropy represents heat loss and the universe is assumed to behave like a closed system.

$$\Delta\text{Intelligence} = \frac{(1)}{\Delta\text{Entropy B}}(K_1)$$

This relationship applies to each separate open system within the universe such as stars, planets, and any individual lifeform, and assumes that higher entropy implies a random, disorganized, disordered system with equiprobable events.

$$\triangle \text{ Intelligence} = (\triangle \text{Volume of Space})(K_2)$$

$$(\text{Entropy A})(K_1) = (\triangle \text{Volume of Space})(K_2)$$

This relationship applies to the universe-wide phenomenon.

K_1 and K_2 represent constants. The determination of K_1 and K_2 may represent a great challenge.

Since any scientific theory requires experimental verification, it is hoped that in time this objective can be achieved for the various unproven hypotheses put forward in this theory. Such verification will require a great deal of imaginative thinking, since our current level of understanding of reality precludes testing some of the concepts presented.

The non-linear evolution of intelligence will be traced from its supposed origin, and a method will be postulated regarding the mechanism of its evolution. The comprehensive nature of intelligence will be reviewed and evidence given to support the viewpoint that it represents a continuum.

The following 24 properties of intelligence are postulated, and hopefully will act as a basis for further expansion and understanding of the concept of intelligence.

Properties of Intelligence

(1) Intelligence (consciousness) is a basic ingredient of the universe and forms an integral part of its fabric along with matter-energy and space-time.

(2) The non-linear evolution of intelligence toward increasingly complex states has a direct mathematical relationship to and interdependence with the entropic process of matter-energy.

(3) The non-linear evolution of intelligence (consciousness) toward increasingly complex states has a direct relationship and interdependence with the spatial expansion of the universe.

(4) There has been an evolution of intelligence toward increasingly complex states which has occurred non-linearly through natural selection, resulting in greater information storage and more complex organisms.

(5) In life forms, intelligence is manifested across a wide spectrum and can even be viewed as a continuum with man at the upper end and the most basic and simplest life forms at the lower end.

(6) The gene is the basic unit that contains the ultimate blueprint for the great variety of ways in which intelligence manifests itself in all life forms; however, the environment is a potent modifier and plays a large role in determining the ultimate level of intelligence that any organism eventually achieves.

(7) Intelligence permeates and governs the motion and direction of all living tissue (plant and animal) and is also manifested at the cellular level.

(8) There is evidence for the existence of intelligence in non- living matter.

(9) There will continue to be further evolution of intelligence at a non-linear exponential rate.

(10) Intelligence either guides the application of physical forces or is itself a force, thus causing or directing the motion of matter-energy and driving the evolutionary mechanism.

(11) The level of intelligence reached by any organism or species is partially dependent upon the sum total of all physical forces operating within the surrounding environment.

(12) Consciousness is an attribute of intelligence, which exists as a spectrum and is not limited to humans.

(13) Human consciousness is most often experienced in an ordinary state; however, it can also occur at times in a variety of altered states.

(14) States of supraconsciousness are obtainable that can lead to the creation of higher-order concepts and a greater understanding of our reality.

(15) The emotions system is a higher-level property of intelligence, and the emotions experienced by an organism affect its intelligence and the way that it expresses itself.

(16) The presence of drives is a property of intelligence at all levels, but is best appreciated in higher life forms.

(17) All disease is the result of partial failure within the intelligence system of any organism.

(18) Intelligence is a universal phenomenon and is present wherever matter and energy exist.

(19) Information content throughout the universe is continuing to evolve toward states of increasing complexity.

(20) Intelligence appears to manifest a process of self-generating complexity as an inherent basic property.

(21) The more intelligent any individual organism becomes, the greater its chance of survival relative to members of its own species as well as to all other animal and plant life in general.

(22) Intelligence would appear to require a life cycle (fertilization to adulthood) to direct its spatial concentration.

(23) Intelligence, like matter and energy, cannot be destroyed.

(24) Intelligence will be influenced by relativistic principles, as are matter-energy and space-time.

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Chapter 3

Intelligence As a Basic Ingredient of the Universe

Properties of Intelligence

(1) Intelligence is a basic ingredient of the universe and forms an integral part of its fabric along with matter-energy and space-time. In quantum mechanics matter and energy are considered equivalent and often simply referred to as matter-energy. Space and time are also usually seen as a four-dimensional continuum, as originally suggested by Einstein. A conceptual diagram of the basic ingredients of the universe is indicated in Figure 1 below.

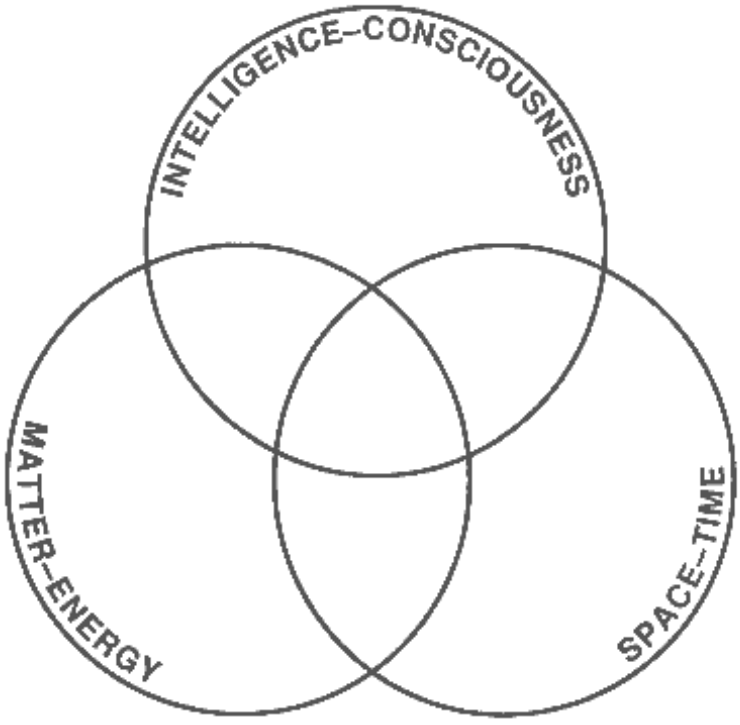


Figure 1.

The basic ingredients are totally interrelated and interdependent upon each other. Intelligence has a direct mathematical relationship to the other basic ingredients, in part based on information theory. (Ref 3.1) More complex states of intelligence require an increasingly complex distribution and spatial concentration of matter-energy, as well as a continuation of the expansion of the universe in space-time. The mathematical expressions will be discussed later in other sections.

Prior to the "big bang," when matter-energy was in a hyperconcentrated, highly condensed state and occupied a very limited space, it would not have been possible for intelligence to manifest itself in the same way that it presently does, just as it was not possible for matter-energy to form the various isotopes (elements) or other more complex objects that we see within our world and universe at this time.

Although intelligence is a basic property of the universe, it requires life forms of increasing complexity in order to manifest itself in the way that we presently think of it. Intelligence is a spectrum or continuum that displays certain limited characteristics in simple life forms, and increasing complexity in higher life forms. Intelligence is also most probably an ingredient of non-living matter, but its presence is not recognized since it does not manifest itself in the familiar ways that we are used to perceiving it. As perceived by our reductionist mind during ordinary consciousness, intelligence should be viewed as an attribute or inherent characteristic of matter-energy, as well as a property of space. In a supraconsciousness state, all basic ingredients would be more properly experienced as a single undivided entity manifesting itself in various forms.

The modern physicist has come to see the world as a system of inseparable, interacting, and ever-moving components, with the observer being an integral part of the system. (Ref 3.2) As we penetrate into matter-energy, nature does not show us any isolated "basic building blocks," but rather a complicated web of relations between the various parts of the whole. (Ref 3.3) According to relativity theory, space is not three-

dimensional and time is not a separate entity, but both are intimately connected and form a four-dimensional space-time continuum. One cannot talk about space without talking about time and vice versa. (Ref 3.4) Time, on the other hand, is also affected by the presence of matter, flowing at different rates in different parts of the universe, as indicated by Einstein. The whole structure of space-time is dependent upon the distribution of matter in the universe, and the concept of "empty space" loses its meaning. (Ref 3.5) Distribution of intelligence and the way it manifests itself is also dependent upon the distribution and concentration of matter-energy. According to David Bohm, "One is led to a new notion of unbroken wholeness which denies the classical idea of analyzability of the world into separately and independently existing parts...". (Ref 3.6) Quantum theory has come to see the universe as an interconnected web of physical and mental relations whose parts are defined only through connections to the whole. (Ref 3.7)

Bohm has also stated, "Relativity and quantum theory agree, in that they both imply the need to look on the world as an undivided whole, in which all parts of the universe, including the observer and his instruments, merge and unite in one totality." Also, "...[M]ind and matter are not separate substances. Rather they are different aspects of one whole and unbroken movement." (Ref 3.8)

He also sees the entire universe to be a constantly changing flux with a pattern of vortices, ripples, waves and splashes, none of which have an independent existence. Elementary particles are continuously arising and vanishing as they are created, annihilated and transformed. (Ref 3.9)

Fritjof Capra has written, "The exploration of the subatomic world...has revealed the intrinsically dynamic nature of matter. It has shown that the different constituents of atoms, the subatomic particles, are dynamic patterns which do not exist as isolated entities, but as integral parts of an inseparable network of interactions. These interactions involve a

ceaseless flow of energy manifesting itself as the exchange of particles; a dynamic interplay in which particles are created and destroyed without end in a continual variation of energy patterns. The particle interactions give rise to the stable structures which build up the material world, which again do not remain static, but oscillate in rhythmic movements. The whole universe is thus engaged in endless motion and activity; in a continual cosmic dance of energy." (Ref 3.10)

Einstein's theories are an example of the interrelationship of matter-energy and space-time. Each massive body has a gravitational field which manifests itself as a curvature of space surrounding the body. The field itself is seen as curved space. The gravitational field and the structure of space are the same. Matter cannot be separated from its field of gravity and the field cannot be separated from the curved space. Thus matter and space are seen to be inseparable parts of a whole. (Ref 3.11)

Mass is no longer considered to be a material structure, and hence particles are not seen as consisting of any basic "stuff," but as bundles of energy. Particles must not be pictured as static three-dimensional objects, like grains of sand, but rather as four-dimensional entities in space-time. Their space aspect makes them appear as objects with a certain mass, their time aspect as processes involving the equivalent energy. Particles are probability patterns interconnected in an inseparable cosmic web. (Ref 3.12)

As presently perceived in quantum mechanics, the quantum field is seen as a fundamental physical entity, a continuous medium which is present everywhere in space. Particles are thought of as local condensations of the field, energy concentrations which come and go, thereby losing their individual character and dissolving into the underlying field. (Ref 3.13) Any material particle, such as an electron, is nothing more than a small domain of electrical field within which the field strength assumes enormously high values, indicating that a comparatively huge field

energy is concentrated into a very small space. (Ref 3.14) There is a basic interconnection with matter, showing that energy of motion can be transformed into mass, and suggesting that particles are processes rather than objects. (Ref 3.15)

Einstein believed that field theory gave a more true representation of reality than did the particle concept. Field equations could have solutions in the form of localized pulses, represented by a region of intense field that could move through space stably as a whole, thus simulating the presence of a particle. These pulses do not end abruptly, but spread out over large distances with decreasing intensity. The field structures associated with two pulses will merge and flow together in one unbroken whole. The perception of an existent particle would appear to be an abstraction that furnishes only a valid approximation of reality. (Ref 3.16)

The distinction between matter and empty space was abandoned when it became apparent that virtual particles can come into being spontaneously out of the void, and disappear again into the void, without any nucleon or other strongly interacting particle being present. The supposed vacuum of space is far from empty. It contains an unlimited number of particles which come into being and vanish without end. The "physical vacuum" as it is perceived in field theory is not a state of nothingness, but rather contains the potentiality for all forms of the particle world. The so-called vacuum is a "living void" pulsating in a continuous rhythm of creation and destruction. (Ref 3.17)

Fred Hoyle has stated, "Present-day developments in cosmology are coming to suggest rather insistently that everyday conditions could not persist but for the distant parts of the universe, that all our ideas of space and geometry would become entirely invalid if the distant parts of the universe were taken away. Our everyday experience, even down to the

smallest details, seems to be so closely integrated to the grand-scale features of the universe that it is well-nigh impossible to contemplate the two being separate." (Ref 3.18)

Life forms also manifest an inherent interdependency. All parts of any living organism cooperate in any action even at the molecular level. Every molecular event occurring within an organism will directly or indirectly influence every other event. The metabolic activities which are constantly occurring produce effects which bear a definite relationship to every other occurrence.

All of the physical forces that exist influence every living organism in many ways. These will be explained in some detail in a later section. Briefly stated, gravity helps determine the size of an organism and restricts its upward motion. Bacteria, birds, dolphins and other organisms use the earth's magnetic field to help orient themselves and navigate. Electromagnetic radiation from the sun influences an organism's body temperature and aids in all internal chemical processes. X-radiation may induce genetic mutations.

Every physical process occurring in nature, of which only a very few have been mentioned above, interfaces with intelligence (and consciousness) and directly influences the biological rhythms and behavior of all organisms.

General Systems Theory

General Systems Theory represents a relatively new concept which is being adopted by many as a replacement for the more traditional Darwinian concept of evolution. This theory evaluates all phenomena in terms of their interdependence and interrelatedness. It sees the integrated whole as something greater than the sum of its parts, whether the theory is applied to single organisms, societies, ecosystems or any other

organized system. (Ref 3.19) The nature of the whole is always seen as different from that of the sum of its parts. (Ref 3.20)

Living systems are multi-leveled structures consisting of subsystems, each of which are wholes in regard to their parts, and each of which represents parts within a greater whole. Atoms form molecules, which combine to form organelles, which in turn make up cells, which are organized into tissues, organs and higher systems. The individual organisms form families, colonies, tribes, societies and nations. Each subsystem is therefore both a whole as well as a part, and each has both an integrative tendency to function as part of a larger whole, and a self-assertive tendency to preserve its individual autonomy. (Ref 3.21)

The activity of any system is referred to as a process known as "transaction," which is the simultaneous and mutually interdependent interaction between all of the multiple components. It is similar in approach to the "new physics" and emphasizes relationships rather than isolated entities. Form is associated with process, interrelation with interaction, and opposites are unified through rhythmic oscillation. (Ref 3.22) All living systems are comprised of interdependent variables that are in a constant state of continuous oscillation between upper and lower limits. (Ref 3.23)

Determinism and freedom are seen to be relative concepts, with the latter appearing more abundantly in systems of organisms of higher complexity. (Ref 3.24) The degrees of freedom manifested by any organism would be directly proportional to its level of complexity.

The earth is also viewed as a system made up of an astronomically large number of subsystems. The Gaia hypothesis best expresses this concept. This planet is seen to represent a complex system of self-organization capable of regulating its own environment, and thus creating and maintaining optimal conditions for the evolution of life. Earth's climate has remained remarkably stable over the past several billions of years

during the development of life forms, even though the energy output of the sun has increased an estimated amount of at least 30%. This implies that the earth has the capacity to self-regulate itself, including not only the chemical composition of the atmosphere and the salt content of the ocean, but all other chemical and thermodynamic processes as well. (Ref 3.25)

Systems theory suggests that evolution occurs through an interplay of adaptation and creation. Adaptation alone is not the core of evolution, which requires some forward impetus. For example, simple life forms such as blue-green algae, which are perfectly adapted to their environment and unsurpassed in their reproductive capability, have proven their survival fitness over several billions of years. There has been no need for any well-adapted simple life forms to evolve into more complex organisms. (Ref 3.26) Systems theory suggests that the environment is itself a living system capable of adaptation and evolution. Both the organism and its environment are in a state of co-evolution. There has been a progressive increase in complexity, coordination and interdependence, with the integration of organisms into multi-leveled systems. Each surviving organism represents a pattern of organization that is continuously interacting with its environment. (Ref 3.27)

Intelligence and Entropy

If it could be demonstrated that intelligence is evolving at the same rate that entropy is occurring, and matter and energy are interchanging, then evidence would exist suggesting a mutual interdependency. It would then follow that the rate of energy dissipation is proportional to the rate of intellectual evolution. This would in turn suggest that the evolution of intelligence is energy-dependent and requires the consumption of energy. From the opposite viewpoint, there is substantial evidence

suggesting that intelligence is at least partially in control of energy utilization and can move matter to further its own ends, not the least of which is to ensure its own continuing evolution. What actually appears to exist is a reciprocal relationship with matter-energy perturbing intelligence, and intelligence controlling the utilization of matter-energy. The interdependency of matter-energy and intelligence might be diagrammed as follows.

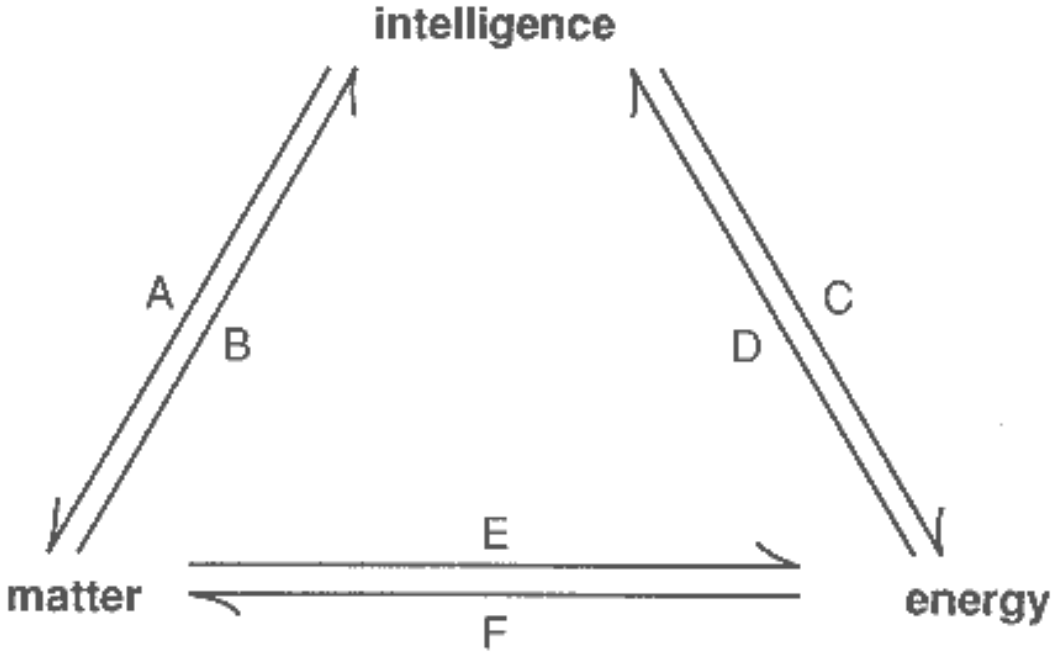


Figure 2.

A) Intelligence can move matter. An individual, for example, exerts mind over matter when making the conscious choice to move an arm and then following through with the act. Other examples of how intelligence exerts control over matter are widely distributed throughout this book.

(B) The motion of matter perturbs intelligence. Any individual's

effective level of intelligence is in constant flux, which at least in part is dependent upon the physical distribution of matter within the brain. Perceptions of reality and behavior are both strongly influenced by the motion of matter in the form of atoms and molecules. For example, neuropeptides acting at the synaptic junctions of neurons directly affect the operation of intelligence. They act to aid in the transmission and communication of information as well as in the feeling and expression of emotion, which in turn influences behavior. The level of intelligence inherent within any organism is, at least in part, dependent upon the spatial distribution of matter, particularly within its central nervous system. The ways that intelligence is influenced by matter are many and varied, and will be discussed in more detail in other sections of this book.

(C) Intelligence at work requires the expenditure of energy. Any time that matter is moved, energy is utilized. Therefore, when the conscious act of moving an arm is performed, intelligence is controlling the expenditure of energy.

(D) The expenditure or dissipation of energy (entropy) perturbs intelligence, and is also necessary to the process of producing an increase in the information content of the universe, as well as allowing the evolution of intelligence to levels of increasing complexity. This will also be discussed in greater detail in another section.

(E) Matter can be converted into energy as defined in Einstein's equation ($E=mc^2$).

(F) Energy can likewise be converted into matter. As the universe has expanded, energy has congealed into matter in increasingly complex states.

Because all of the basic ingredients of the universe are strongly interdependent and interconnected, intelligence has certain properties, which are specifically related to space, time, matter and energy.

Intelligence Related to Space

Intelligence (mind) is related to space, and even has a definite spatial distribution as well as a presence in space. This can best be illustrated by examining the properties of memory, one of the most important attributes of intelligence. It would appear that the storage of memory is almost certainly a holographic phenomenon rather than being concentrated at a point source. This concept is heavily supported by the majority of brain research which has been done on the subject, and this will be discussed in greater detail in another section. The holographic memory process might occur in two different ways, with the first one being the more probable.

First, "mind-space" could be encoded with a specific memory by perturbing, warping or physically imprinting it. The encoded imprint would have to be at least semipermanent. This might conceivably be reflected in some way by an alteration of the field characteristics of the organism, much like Rupert Sheldrake envisions in his description of a morphic field. The shape of the mind-space field would gradually modify in time as it is slightly altered with each new encoded memory. The memory decay process would be intimately related to the continual restructuring and reshaping of the mind-space field. The intensity of any recorded memory would be directly related to the extent that the mind-space field was altered. A memory which was encoded during a strongly experienced emotion would be more durably imprinted over a larger volume of mind-space than a memory encoded during a weakly experienced emotion. Both the imprint of the mind-space will be stronger, and the volume involved larger, when a memory is encoded during the experiencing of strong emotion.

Second, the memory-encoding process requires that matter-energy be perturbed into a specific, complex spatial distribution. It has been determined that as new memories are encoded the physical brain structure is modified. New dendritic attachments are formed between neurons while older ones are breaking down. This undoubtedly is a requirement for the storage of new memories; however, it does not mean that the memories are contained within the atoms and molecules themselves that form the neurons and dendrites. The physical, spatial distribution of molecules within the dendrites, as well as the distribution of dendrites themselves, is a reflection of the mind-space imprint pattern.

Even though the brain, as well as all other tissue, appears to have a material property which is semi-rigid, and therefore might conceivably lend itself to a memory storage process based only on the strategic positioning of matter (atoms and molecules) within neurons and dendrites, this is unlikely. The material substance of the brain is constantly changing. Atoms and molecules are continually being replaced by others in all organic and inorganic systems. The atoms and molecules within the brain will be replaced many times over during the life of the organism. Many memories last a lifetime, bridging across the replacement of brain matter several times over. Atomic and molecular decay occurs much more rapidly than can account for memory decay. All things considered, it is highly probable that intelligence (mind) is more a property of space than of matter-energy, although it also has properties which definitely relate it to the latter as well.

Intelligence Related to Time

Intelligence has time-related properties. Without the presence of consciousness (mind), the concept of time would cease to exist; and without the presence of time there could be no mind, since the latter represents the process of what the brain does, and for any kind of process to occur requires time. Without mind, time would become a

fourth-dimensional measure of distance. The perception of time can speed up or slow down dependent upon brain function. Our minds are not actually conscious of time. We are aware of "time-related events" that create the perception of time. Our conscious and unconscious mind is constantly being perturbed by time- related events such as spoken words, car horns, music, rattling motors, flashing lights, people walking by, etc. These events are continuously overlapping as they create our perception of time.

Our memory has been programmed to know approximately how long each time-related event should last, and as long as one is conscious he or she will have a fairly good time sense. One quickly loses time sense during sleep, altered states of consciousness, or coma. Continuous unaltered consciousness is a prerequisite for the preservation of time sense.

Memory storage is also a time-related event. The duration of time involved for any incoming stimulus will strongly influence the intensity of memory recording, which in turn influences our ability to recall the memory at will. There are also other ways that intelligence is related to time, and they will be mentioned in other sections. Not the least important of these is the requirement of the passage of time for the continued evolution of intelligence to states of increasing complexity.

Intelligence Related to Matter-Energy

Intelligence would also appear to have matter-energy related properties. It seems to congregate around matter, interfacing with it and requiring the expenditure of energy to function, at least in our present level or dimension of existence. The intensity of any incoming stimulus such as light, sound, etc., will influence the degree to which matter-energy in our brain and/or body is perturbed, which in turn influences the intensity of memory-recording occurring in mind-space. The memory-recall

process is also very much dependent upon the intricate, complex arrangement of matter-energy within the brain-body. Many memories and other body functions will be lost if brain tissue is disturbed by a stroke or other type of trauma. So even though mind is a space-related phenomenon, it still requires and is very much dependent upon a very special distribution of matter within the brain, and its ability to interface with it.

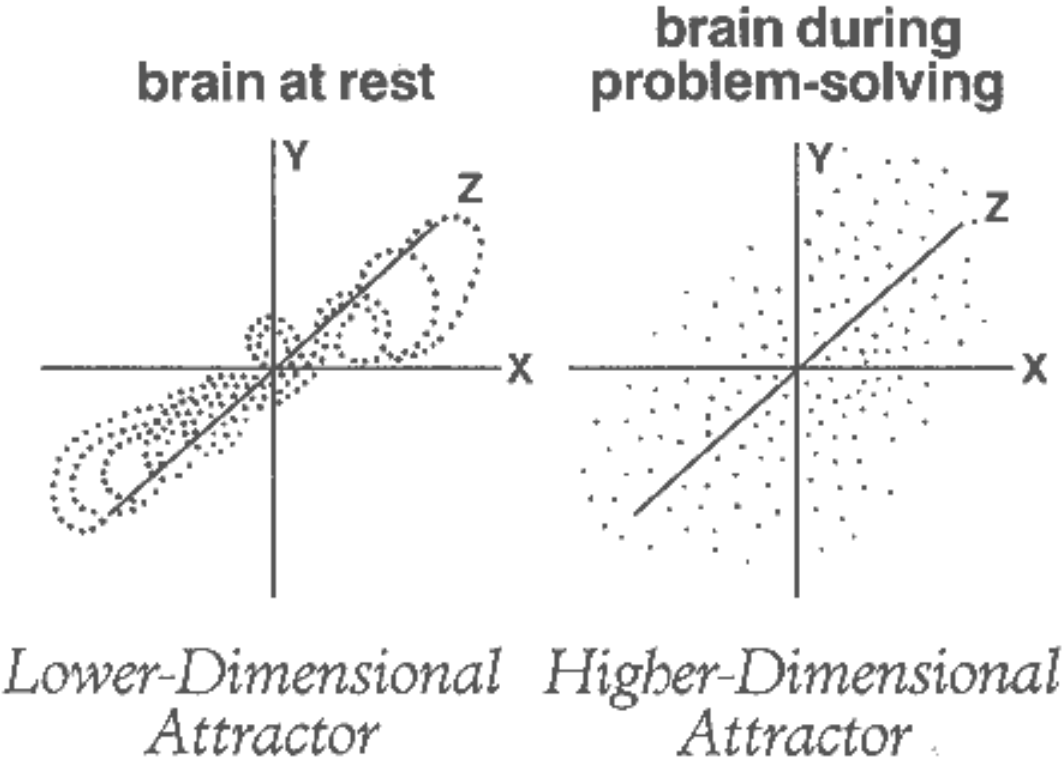
Science of Chaos

Every event that occurs within the universe influences every other event either directly or indirectly. This is where Newtonian mechanics breaks down, thus resulting in our failure to predict long-range future events. The weather will never be predictable more than just a few days in advance because of very strong dependency upon "initial conditions." It is sensitivity to initial conditions that is the fundamental cause of chaos. Since initial conditions can never be completely known, it is impossible to predict long-range future events. Complexity leads to uncertainty. (Ref 3.28)

It has been determined, however, that even chaos has a hidden, underlying order not previously suspected, which can be illustrated on a three-dimensional graph in the form of an "attractor." Seemingly random events will produce an orderly arrangement of dots which conform to a rather specific configuration. The figure produced isn't completely predictable, but it is not completely random either. It represents a state of restrained randomness. (Ref 3.29)

The nervous system is normally in a state of orderly chaos, and whether one is awake, asleep or actively thinking will determine whether it is in a higher or lower-dimensional chaotic state. When the mind is at rest, an attractor, as seen on a three-dimensional graph, will appear to be more organized and less chaotic than while problem-solving. The following

graph can be produced by performing a mathematical analysis of an EEG. (Ref 3.30)



The attractor during problem-solving not only appears more random and complex, but is distributed over a larger volume of space. This seems to represent a graphic display of a mind that is rapidly searching through a greater number of stored memories or a larger volume of stored information. These two different attractor patterns would be very consistent with the model presented above suggesting that memories are stored in mind-space. The attractor patterns should also be considered to represent evidence in support of this concept.

It is becoming increasingly clear that the distinction between intelligence, matter-energy and space-time is less discrete than previously thought. All of these basic properties are strongly interdependent and interconnected. The evolution of intelligence could have occurred only in conjunction with all of the other natural phenomena which are randomly occurring throughout the universe. All events are interdependent.

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Chapter 4

Non-Linear Evolution of Intelligence--Dependence Upon Entropy

(2) The non-linear evolution of intelligence toward increasingly complex states has a direct mathematical relationship to and interdependence with the entropic process of matter-energy. This applies when viewed as a universe-wide phenomenon. It does not apply when viewing each separate open system contained within the universe, with the latter representing an inverse or reciprocal relationship.

The law of entropy, although originally restricted to thermodynamics only, has been more widely applied so that it is now regarded as the most general regulator of natural activity known to science. (Ref. 4.1) As stated by A.S. Eddington, "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". (Ref. 4.2) Therefore, the construction of a theory of intelligence around the process of entropy would seem to be a valid place to begin, even though some difficulties do arise.

The understanding of the law of entropy no longer seems to be nearly as clear-cut as Eddington suggested. There are apparent contradictions and paradoxes that result from our incomplete understanding of the definition of entropy. The correlation of existing concepts is tenuous, and in all probability will require modification in time.

At the moment of creation, which is currently considered to best be modeled by the "big bang," entropy was supposedly at its minimum. It has been increasing ever since and should continue to do so hereafter.

One contradiction arises when it is assumed that entropy decreases within a system any time information increases. This doesn't represent a problem so long as the system is a local open system, since it is known that even though the local system is decreasing in entropy, it is at the expense of an overall increase in entropy within the surrounding environment.

So where is the contradiction? Well, even though in all open local systems there is a decrease in entropy when there is an increase in information, the opposite would seem to hold true when viewing the universe as a whole. On a universal level there would appear to be increasing entropy at the same time that there is increasing information. This would seem possible if we make the assumption that neither energy nor information can be created or destroyed. What we are witnessing on a universal level is a redistribution of both, with information concentrating or focusing into all local systems as energy is being continuously dissipated or distributed into an ever-expanding space.

It would seem possible to eliminate the information-entropy paradox, as well as others not stated above, if we make the following assumptions:

> (1) Energy can neither be created nor destroyed. This holds true throughout the entire evolutionary history of the universe, although its spatial distribution and form is continuously

changing. It can exist as heat, light, work, electricity, chemical processes and mass.

(2) Intelligence can neither be created nor destroyed, and its overall quantity remains constant throughout the universe even though its spatial concentration is continuously changing over time as it discovers innovative ways to relate to matter and energy.

(3) The terms information and intelligence, though not synonymous, can be used interchangeably in any mathematical equation.* The mathematical relationship of information to entropy is essentially the same as that of intelligence to entropy. An increase in information parallels any increase in intelligence.

(4) Heat entropy represents the dissipation of energy that becomes lost in space and is no longer available for useful work.

***The similarities and differences between information and intelligence will be discussed later in this chapter.**

As the universe has undergone an evolutionary process, the distribution of intelligence and consciousness has been continuously changing. It had a reasonably homogeneous distribution in the very early universe, as did energy. However, as matter-energy began to congregate into separate foci, so did information, intelligence and consciousness. For energy to be able to precipitate out into matter and complex structures, its dissipation into expanding space was required. The apportionment of energy and intelligence was essentially uniform at the moment of creation, and soon thereafter began to become increasingly heterogeneous in its distribution. As matter-energy concentrated into more complex, sophisticated structures, so did intelligence and consciousness. Not only did intelligence concentrate into the same spatial forms as matter-energy, but in all probability directed its distribution. Intelligence is distributed throughout the entire universe,

but is concentrated into specific areas and is rarified in others, just like matter-energy.

Assuming that energy and intelligence (consciousness) can neither be created nor destroyed, then what we are witnessing through the evolutionary process is a continual redistribution of both throughout space-time. At the moment of creation all energy was potentially available to perform useful work. As the universe has evolved, much of that energy has been dissipated and lost as far as being available to perform work. In this sense the universe is therefore moving from a state of low entropy to one of high entropy. As the universe unfolds it continues to produce an increasingly greater number of complex systems. Intelligence (consciousness) then continues to concentrate into those systems. The amount of energy and intelligence throughout the universe remains unaltered, but their distribution is continuously changing.

As the average level of energy per unit volume of space within the universe has been dropping, because space is expanding into a larger volume, intelligence has become more effective in controlling its movement. The following metaphor might help understand this concept. My intelligent mind is incapable of redirecting the flight of a high-energy bullet coming toward me. However, it would be able to deflect a lower-energy baseball, thus avoiding injury. The greater the momentum of any object in motion, the less effective intelligence is in altering its direction of travel. In the early universe when the energy density (average energy level per unit volume of space) was very much higher than now, it was not possible for intelligence to manipulate and distribute matter with the same degree of effectiveness as at the present time. Just as energy throughout the universe is not altered in total quantity, but may lose quality, intelligence does not alter in quantity, but is continuously increasing in quality as it relates to material structures and its ability to direct work.

Following World War II, the concept of entropy underwent a transformation of understanding when it was linked to information theory. The classical view of entropy implied that chaos and confusion were the rule, and that chaos was the ultimate destiny of all things. This concept has since been modified. The relationship is still incompletely understood and is still being questioned. This therefore makes any discussion of entropy as to how it relates to information and intelligence very difficult. The concepts dealt with in this chapter might be expected to change somewhat as our understanding improves. What is presented might at best turn out to be an approximation of the reality.

Until there is a better understanding of entropy, it might be helpful to divide its meaning into the following:

> Heat entropy can be defined as a thermodynamic measure of the amount of energy unavailable for useful work in a system undergoing change. It was at a minimum at the origin of our universe relative to the amount of energy potentially available for the performance of useful work. It continues to increase on a universal scale.

> Information entropy can be defined as the measure of the degree of disorder in a substance or system undergoing change. It measures the capacity to convey meaning, and was at a maximum at the origin of our universe relative to the state of disorder present. It continues to decrease on a universal scale. In information theory, entropy is a measure of the information content of a message evaluated with respect to its uncertainty. (Ref. 4.3)

Open systems, which apply to every object within the universe, have both a decreased heat and information entropy locally during their entire lifespan or period of existence. The universe when observed as a whole

would appear to be undergoing increasing heat entropy, but decreasing information entropy.

Organic systems create order out of chaos and are negatively entropic (both heat and information), with a net gain of information, until death. According to Lila Gatlin, when applied to living organisms entropy measures the randomness of a system. Higher entropy implies a random, disorganized, disordered system with equiprobable, independent events and has potential for acquiring and storing information. Lower entropy implies a non-random, organized, ordered system with a divergence from equiprobable, independent events, and with stored information. (Ref. 4.4) Her definition best describes information entropy.

When an organism reproduces, it extracts free energy from its surrounding environment and creates a new subsystem with a high degree of statistical order or information content, locally decreasing the entropy at the expense of a heat entropy increase in its environment.

According to Rudolf Clausius, who established the first and second laws of thermodynamics, the energy of the universe is a constant, and the entropy of the universe tends toward a maximum. (Ref. 4.5) The universe was initially in a highly energized uniform state, essentially void of information, and has since become extremely complex with an enormous amount of stored information, thus reflecting a lower information entropy but at the same time a higher heat entropy.

The second law of thermodynamics, as interpreted by some, dictates that the universe is moving irreversibly toward increasing decay and disorder. Heat results in increased molecular motion, and as moving molecules collide with each other they are knocked out of their expected course into random paths. As molecular collisions continue, there is an increased randomness, moving the universe toward chaos. It has been postulated that this will eventually result in heat death of the universe, with the production of a tepid, homogenous soup of random atoms and

molecules. (Ref. 4.6) If the law of entropy was the only force acting upon matter within the universe, then this outcome would seem to follow.

The heat death hypothesis, however, does not fit well with more current thinking, since the universe seems to be gaining in information and complexity. Entropy is occurring as originally conceived from the standpoint that isotopes are disintegrating and objects are giving up heat and energy; however, rather than systems becoming more random as they approach equilibrium, they are moving toward a state of higher complexity. The universe began in a state of high equilibrium and total chaos and is becoming increasingly more organized. I perceive a universe, as do many others, that is continually becoming more materially and physically complex. It is relying heavily on the entropic process to allow this to occur.

With the expansion of space, there is more room for energy to entropically dissipate, thus allowing matter to continuously congeal into more complex forms. Material forms are also continuously breaking down through the entropic process, but in time they once again reorganize into more highly complex physical structures. Through the evolutionary process, macroscopic structures undergo entropy with the breakdown of macroscopic information into microscopic information. The breakdown products, as they are reorganized into more highly organized complex forms, result in a continual net gain of useful information within each separate isolated open system.

Even though stars, as well as our earth, are involved in the heat entropic process, they are also concurrently gaining in information. As stars convert hydrogen to helium and then into heavier elements, a great deal of energy is being released so that heat entropy is occurring; however, each star is nevertheless gaining in information at the same time. The earth likewise is undergoing heat entropy as its central core gradually cools, and as rocks fragment and isotopes decay; however, it is also gaining in information. The earth today is a much more ordered system,

richer in information, than when compared to the time of its origin. The earth during its entire evolutionary process has continuously gained in information. The universe as a whole, although it is undergoing heat entropy as energy is being dissipated, is also continually gaining in information.

Not only do lifeforms and stellar systems exist as open systems, so do cultures and social arrangements. Although they all dissipate energy and are undergoing entropy, they also are becoming increasingly complex, and increase their stored information with time. (Ref. 4.7)

The second law implies that disorder can never spontaneously give rise to order, and it forbids entropy of a complete closed system from falling. (Ref. 4.8) Assuming this statement is true, as most scientists have come to believe, then there must be some opposing syntropic force. Prigogine believes entropy to be the catalyst of syntropy or increasing order and complexity. (Ref. 4.9) His theory of dissipative structures suggests that open systems, which include all lifeforms, are perturbed by energy fluctuations as a result of their interaction with the surrounding environment. These perturbations over time cause these systems to undergo entropy and fall apart. The chaos or disorder that results allows new interactions and recombinations, so that a system can fall together again at a higher level of order. Thus open systems continually evolve to a higher order of complexity. (Ref. 4.10)

The term syntropy has been coined to imply a process opposite to that of entropy. Buckminster Fuller has been quoted to define syntropy in the following manner: "The history of man seems to demonstrate the emergence of his progressively conscious participation in theretofore spontaneous universal evolution.... My continuing philosophy is predicated...on the assumption that in dynamic counterbalance to the expanding universe of entropically increasing random disorderliness there must be a universal pattern of omnicontracting, convergent,

progressive orderliness and that man is the anti-entropic reordering function....". (Ref. 4.11)

Szent-Gyorgyi has also stated the following about the syntropic process, which is the process by which the universe reconstitutes itself: "But there is mounting evidence for the existence of the opposite principle: Syntropy--or `negative entropy'--through the influence of which forms tend to reach higher and higher levels of organization, order and dynamic harmony". (Ref. 4.12) Living matter has an inherent drive to perfect itself.

Ouspensky, interpreting Gurdjieff's works, has described the relationship of involution (entropy) and evolution (syntropy) as transformational processes. Both together comprise the "reciprocal maintenance of the universe". (Ref. 4.13)

I believe that this anti-entropic or syntropic process represents a property of intelligence and is under its control. Even though the universe as a whole is gaining in heat entropy, virtually all subsystems are swimming upstream against this tendency and are becoming more complex and richer in information. It may ultimately be decided that entropy is also under the control of intelligence. Intelligence might arbitrarily be divided into entropic and syntropic systems.

Information Theory

It is also essential to gain an understanding of information theory before we try to relate the evolution of intelligence to the entropic process. Even though I do not view the terms "information" and "intelligence" as synonymous, they do have some common attributes and roughly approximate each other, particularly as they relate mathematically to entropy.

The term intelligence implies more than the term information. Intelligence implies the presence of consciousness, as well as manifesting an active role-directing process. It also implies a system's ability to make choices in active fashion based on its stored information content. These choices are not necessarily being made consciously and, as a matter of fact, most in all probability are being made automatically or unconsciously as indicated earlier. One of the properties of intelligence is the underlying positive force inherent within nature that is both pushing and directing the evolutionary process throughout the universe. Intelligence also differs in concept from information in that some of its properties imply the ability to think, learn, create, intuit and feel. Information implies a more sterile, inactive ingredient.

I perceive another difference between the terms information and intelligence. The amount of information stored in any system is equal to the sum of all of its parts so that if a macrostructure disintegrates, the resultant microinformation, at least according to Layzer, is equal to the sum total of macroscopic information initially present. (Ref. 4.14) Intelligence, at least part of which comprises "mind," and particularly as it applies to humans, most likely exceeds the sum of its parts as compared to purely stored information. An approximation of this concept might be made with the following formula:

Intelligence = (Information + Consciousness)*

Information = (Intelligence - Consciousness)

*These formulas apply only to individual, isolated open systems that arise within the universe, and not to the universe itself. The overall levels of intelligence and consciousness remain constant throughout the universe as a whole. As matter-energy concentrates into increasingly more complex

structures, so does intelligence. Since the overall quantity must remain constant on a universal scale, as intelligence is concentrated into specific areas it becomes rarified in others.

Into any of the derived mathematical equations that apply to information theory, (Intelligence - Consciousness) could be substituted.

The basic concept in information theory is that information can be treated very much like a physical quantity such as matter-energy. It has already been recognized by various scientists that there is more to universal existence than matter-energy and space-time. As stated by Jeremy Campbell, "To the powerful theories of chemistry and physics must be added a late arrival: a theory of information. Nature must be interpreted as matter, energy, and information." He has also stated that information is an active agent that "informs" the material world, similar to the way genes instruct the cell machinery to build an organism. (Ref. 4.15) Information is perceived to be a universal phenomenon and not just a quality of our local system.

Claude Shannon published two articles in the Bell System Technical Journal in 1948 which led to the creation of the "Theory of Information." He developed mathematical equations relating energy and information, utilizing entropy as the connecting link. (Ref. 4.16)

Information is a property of all physical systems and is a measure of how highly organized they are. The information content of any system is the minimum number of bits required to encode a complete statistical description of the system. According to Shannon, the concepts of entropy and information are closely related by a conservation law, which states that the sum of the information and entropy is constant and equal to a system's maximum attainable information or entropy under a given

set of conditions.

$H + I = \text{constant} = H_{max} = I_{max}$
(applies to open systems only)

H = Thermodynamic entropy

I = Information

H_{max} = System's maximum attainable entropy

I_{max} = System's maximum attainable information

Any gain of information is compensated for by an equal loss of entropy (both heat and information). [Ref. 4.17] This applies to any open system whether it be a star, planet or living organism. As information content increases, there is a decrease in entropy locally within the system. When the universe is viewed as a whole however, both information content and heat entropy are increasing as would be expected in a closed system.

Shannon demonstrated that the log function of a number to base two determines the measure of information. Previously, Boltzmann found that this same log function determines thermodynamic entropy. For this reason one can conclude that a gain in information corresponds mathematically to the loss of entropy in any open system. [Ref. 4.18] A corresponding increase in entropy can then be accorded to the surrounding universe if it is considered to be a closed system, so that both information content and entropy are increasing simultaneously throughout a closed universe.

Norbert Wiener, while working on his doctoral dissertation at MIT in 1949, also recognized the relationship of entropy to information, and even stated that "information is entropy". [Ref. 4.19] I interpret this to

mean that there is a net gain of information any time energy is dissipated through the entropic process. As energy dissipates, matter congeals, and a higher level of order containing greater information is achieved.

Since all systems undergoing entropy do so exponentially, and since the accumulation of information has a direct relationship to the entropic process, it would seem reasonable to suggest that the evolutionary gain of information has likewise occurred exponentially. It might also follow, then, that the evolution of intelligence, which has undoubtedly occurred non-linearly, has occurred exponentially as well, since the level of intelligence of any organism is directly proportional to its information content.

The universe as a whole, which may be a closed system, was at its low point of heat entropy at the instant of its creation and has been continually gaining in entropy ever since. It is dissipating its available energy into a constantly increasing volume of space. Every object within the universe, organic or inorganic, is an open system and during its life cycle, or period of existence, is in a state of negative heat and information entropy (syntropy). It is becoming more complex and contains increasingly greater amounts of information. Each object (subsystem) is locally decreasing its amount of entropy at the expense of an entropy increase in its surrounding environment. There would appear always to be a net increase in entropy throughout the universe, assuming that it is truly closed.

Shannon's formula, **H + I = constant**, would appear to apply to any open system. As a structure is more complex, containing a greater amount of information, it is also in a lower state of both heat and information entropy. The greater the amount of stored information an organism has, the lower its state of entropy. This formula does not appear to apply to a closed system such as the universe, which is both increasing in heat entropy as well as information, unless of course the universe isn't closed. There is in fact a question as to whether the

universe is open or closed. If there are other universes beyond our own, then perhaps energy exchange might be taking place between them. It has been suggested that a black hole in one universe might be a white hole for an adjacent universe.

Intelligence is the only property within the universe that is evolving in the direction of increasing complexity in opposition to entropy. Boltzmann approached the recognition of this concept in 1894 when he stated that entropy was related to "missing information." He expressed this concept mathematically in the following way: $S = k \log W$. S = Entropy, k = Boltzmann's universal constant, and W = the number of ways in which the parts in a system are so thoroughly randomized that there is no reason to expect the system to favor one particular arrangement of parts over any of the great number of other possible arrangements. (Ref. 4.20)

Forces of chance and of anti-chance coexist in a complementary reciprocal relationship. The random element is entropy, the agent of chaos, which tends to destroy meaning. The non-random element is intelligence, which exploits the uncertainty inherent in the entropy principle so as to generate new structures, and to inform the world in new and more creative ways. (Ref. 4.21)

Shannon came a step closer to recognizing the universal property of intelligence when he first presented his information theory. He indicated that sense and order could prevail against nonsense and chaos. The world could advance in the direction of greater information content and more complex structures, both physical and mental. He suggested that order was entirely natural. He proved that information in the form of a message could persist in the midst of haphazard disorder or noise. He also gave the first precise scientific measure of information, and indicated that the amount of information present in a system was of the same form as the equation devised for the entropy principle. Shannon's entropy equation suggested that there was a most compelling analogy

between entropy and information. Information theory implies that as structures, living and non-living, become more complex, they also gain in information. (Ref. 4.22)

Lila Gatlin in 1972 applied information theory to living systems. She has defined "life...as an information processing system--a structural hierarchy of functioning units--that has acquired through evolution the ability to store and process the information necessary for its own accurate reproduction". (Ref. 4.23)

Information in the individual living system is stored, at least in part, in the DNA molecule by the sequential arrangement of adenine, thymine, cytosine and guanine bases. Because the strands of DNA are so long, the number of possible base sequences in a single strand exceeds the estimated number of particles in the universe. (Ref. 4.24) This allows for an extremely large amount of information storage. She made the assumption that when this stored information within the DNA is translated into the substance of protein molecules, then communication takes place. (Ref. 4.25)

Evolution would appear to be more than just random changes in proteins that are selected for fitness by purely external factors like ecology, population clusters, food supply, and competition. It has an internal, abstract side as well, which can be understood in terms of the laws of information and communication. (Ref. 4.26) DNA would appear to be more than just a passenger in the emergence of living organisms. Biologists King and Jukes concluded in 1969 that evolutionary change is not imposed upon DNA from without, but rather arises from within: "Natural selection is the editor, rather than the composer, of the genetic message". (Ref. 4.27)

More and more support for the concept of "active information" is accumulating from a variety of sources that would correlate closely with Sheldrake's morphic fields and Jung's archetypes. "Active information,"

as it is being defined, would be very similar in concept to "intelligence" as described in this text. David Bohm, for example, is developing a new theory of "quantum potential" that has some features similar to Sheldrake's fields.

Bohm's theory suggests that wave particles have considerable internal complexity and are represented by fluctuations within a quantum field. The field forces differ from others in nature in that the quantum potential influence does not fall off with distance, and its action does not take the form of a mechanical push or pull but acts more like a guide wave. (Ref. 4.28) The quantum potential carries information about the environment of the quantum particle, and by so doing informs and affects its motion. He suggests that matter has orders that are closer to those of mind and gives "information" an active formative role. (Ref. 4.29) This active information is responsible for the way that quantum processes unfold out of the quantum field of the universe. Each elementary particle may be of unlimited complexity and have holographic properties, being in essence an expression of the entire universe. (Ref. 4.30)

An elementary particle is the manifestation of an underlying quantum field and represents a folding of the field into a localized region. In reciprocal fashion, the annihilation of a particle is the unfolding back into the field. (Ref. 4.31)

Bohm suggests that all of reality is based on an "implicate" order where elementary particles are continuously enfolding and unfolding within a dynamic background. Our everyday world of solid structures corresponds to an "explicate" or unfolded order, which is actually a manifestation of an unfolding from the deeper implicate order. All forms unfold out of the same ground, and the forces that we perceive to be present are actually illusionary and reflect the unfolding of explicate forms from the implicate order. (Ref. 4.32) He sees mind and

consciousness operating within the implicate order through fields of active information. (Ref. 4.33) The brain is continuously structurally unfolding from a background of active information that is present both in its own structure and in the external environment. This constantly changing brain in turn acts back upon the environment to change it and to create a new reality. (Ref. 4.34) In essence, the material level is perceived by the mental level, which then acts back on the material side. (Ref. 4.35) A two-way flow therefore exists between the mental and material orders of the universe, which are essentially indivisible. (Ref. 4.36)

Bohm also suggests that below the quantum field there are even more subtle levels of process that are involved in loops of active information. This represents a hierarchy that extends into increasingly more subtle levels of existence in which both matter and consciousness are contained. (Ref. 4.37)

David Layzer in 1975 presented a theory of universal evolution in which he recognized three arrows of time. The first is the arrow of cosmic expansion directed away from the initial universal state, which was infinity condensed, uniform and devoid of information. The second is the arrow of history, which is defined by the evolution of galaxies, stars, planets, life, civilization and mind, all of which are becoming increasingly complex with more information. The third is the thermodynamic arrow of increasing entropy, which involves the continual breakdown of macroscopic structures to simpler forms. (Ref. 4.38) He also, therefore, relates the entropic process to universal expansion and the evolution of increasing information.

Through all the apparent confusion it has been repeatedly recognized that there are two seemingly opposing processes occurring throughout the universe. There is a tendency for all things to degenerate and a

tendency toward continuous creation. It is our reductionist mind-view that causes us to interpret these two processes as being in opposition. They are both necessary integrative functions which work together to allow the evolutionary process to occur. There are mathematical relationships that can be applied which we are just beginning to understand. As long as we keep it simple and see the two opposing processes as equal in importance, the concept is relatively easy to comprehend. We only get into trouble when we try and reduce the total overall view into small component parts, again reflecting the operation of our reductionist, analytical mind as we experience it during ordinary consciousness states.

We also get into trouble when trying to understand the basic entropic-syntropic process, because we don't yet know whether to view the universe as an open or closed system. Clearly every object within the universe, without exception, is open.

Any mathematical expression as it applies to entropy will also be influenced by the rate that the universe is expanding. Is this rate slowing down, speeding up, or remaining constant? Because of the unknown we can only approximate our description of this part of our reality. As more is discovered we will be able to refine it.

All of the above theories have one basic common denominator. They all recognize the fact that there are both living and non-living systems which are continually gaining in information in opposition to the universe-wide entropic process, and that they have a relationship mathematically.

That entropy is occurring exponentially can be witnessed in a variety of ways. Isotopes decay exponentially at very predictable rates, each with its own individual half-life. The following is a typical example of an exponential decay curve. (Ref. 4.39) All exponential curves would have similar slopes.

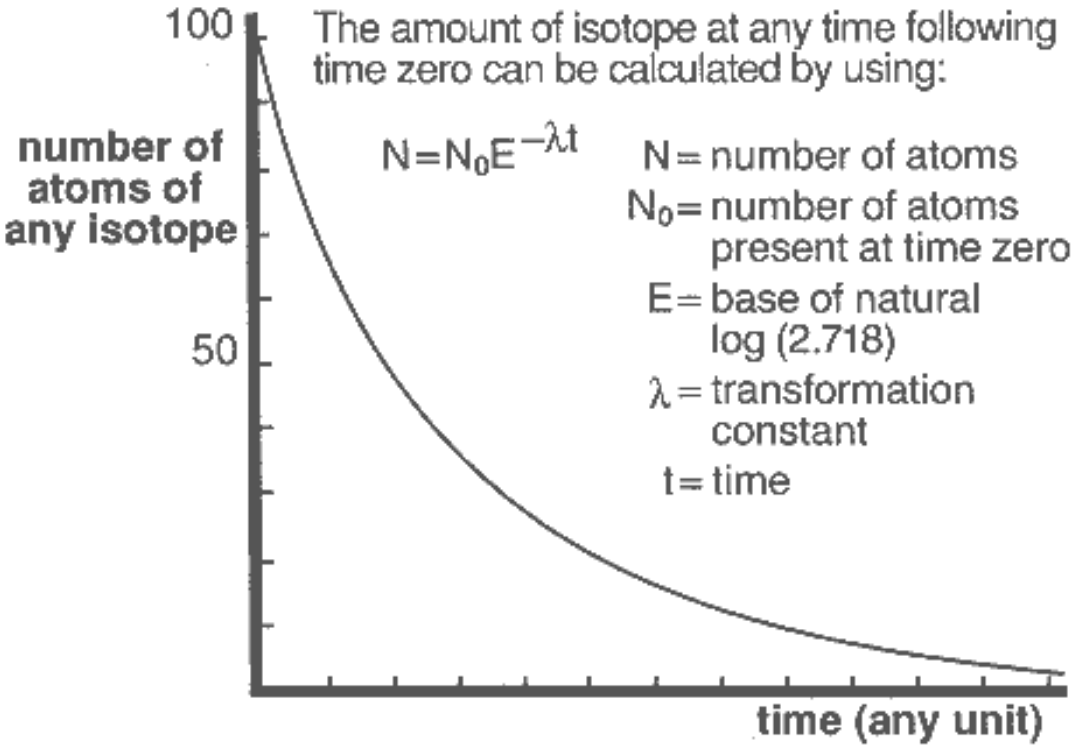

Figure 1.

Any body losing heat does so exponentially. A cup of hot water will have the following temperature drop per unit of time as energy is dissipated. Notice that the slope of the curve is very similar to the previous one, since both are exponential.

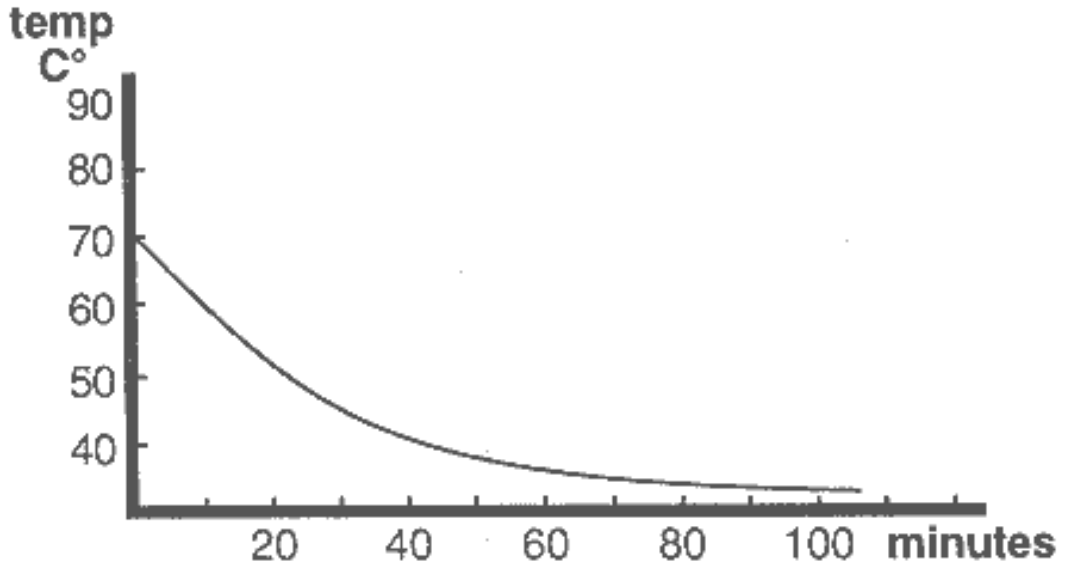

Figure 2. *(actual experiment)*

Gas molecules will escape from a closed container at an exponential rate if an opening is suddenly created.

If the discussion of entropy and how it relates to open and closed systems and the accumulation of information has seemed more confusing than illuminating, it is our analytical, reductionist thinking that is partially to blame. Our present terminology is imprecisely defined, leading to confusion and misunderstanding. The entire concept put forth can be simply stated as follows: There are opposing processes occurring within our universe that are interdependent. There is the tendency to break down and burn out, and the opposing tendency to build up and become more complex. These processes have a mathematical relationship that in all probability is based upon an exponential function.

It would seem that the entire entropic process occurs at an exponential rate. Perhaps energy is being dissipated exponentially because available space is increasing non-linearly, if not exponentially, based on the universe's volume-doubling time. This will be further discussed in greater detail in the next section. Intelligence might then be evolving exponentially based on its interrelationship and interdependence with the other two. It would seem as if there is good justification from a scientific viewpoint to conclude that an interrelationship exists between the entropic process, as it is occurring throughout the universe, and the evolution of intelligence to states of increasing complexity.

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Chapter 5

Dependence of the Evolution of Intelligence Upon Spatial Expansion of Universe

(3) The non-linear upward evolution of intelligence (consciousness) has a direct relationship and interdependency with the spatial expansion of the universe.

Intelligence would appear to be a space-related property rather than a simple condensation into matter-energy. In other words, it resides outside of matter-energy condensation but nevertheless is constantly interacting and interfacing with it. Evidence for this is the fact that matter-energy is continuously undergoing entropy at an exponential rate, having a direct relationship to intelligence, which in turn is evolving to states of increasing complexity. In a sense they are moving in opposite directions. Nevertheless, it would appear that increasingly higher levels of intelligence require progressively more complex arrangements of matter-energy.

To better illustrate the evidence that intelligence is a property of space rather than simply an inherent ingredient of matter-energy, one might look at the brain and its function. There are about ten billion cells in a human brain and each of them receives an average of 10,000 connections from other brain cells. Each cell has its own molecular structure renewed completely at least 10,000 times during its life. Since the brain loses more than 1,000 cells each day, there are more than a trillion cross-linkages obliterated every 24 hours. Even though the material structure of the brain is constantly undergoing entropic change,

including a tremendous turnover of atoms and molecules, our basic behavioral patterns and experiential memories remain. We are constantly changing in many ways, but remain recognizably ourselves with an identifiable personality structure. (Ref. 5.1)

One of the prerequisites for the upward evolution of intelligence has been the expansion of the universe (i.e., space). As more space has become available per unit of matter-energy, it has allowed the formation of increasing numbers of more complex atoms and molecules.

According to Layzer, uniform disorder prevailed prior to the "big bang" at the beginning. Information, regarded as a measure of the non-uniform orderly properties of physical systems, evolved out of the initial state of perfect confusion. Cosmic expansion was the cause of the infant universe departing from a state of maximum chaos. As long as the processes which randomized the distribution of energy and concentration of the various types of particles were very fast--faster than the rate at which the cosmos was expanding --equilibrium was maintained. Bits of atoms smashed into one another in the confusion of that very dense, undifferentiated state with such frequency that structures were prevented from arising. The speed of cosmic expansion was increasing, and once it became greater than the speed at which forces of disorder could degrade information by collisions, chemical equilibrium was broken. As encounters between particles became less frequent because of greater distances between them, and as they continuously lost energy, the equal distribution of different kinds of particles could not be maintained. This resulted in the chemical composition of the universe changing from a state of equilibrium to one of disequilibrium as the expansion proceeded. (Ref. 5.2) The evolution of intelligence could not occur until the state of universal expansion allowed complex molecules to form.

The challenge facing us is to define mathematically the relationship between evolving intelligence and the rate of universal expansion. If the universe was in a state of contraction rather than expansion, then the two

processes would have an inverse relationship; however, since the best scientific evidence at this time would suggest that the universe is expanding, our hypothesis is based on this latter assumption.

$\triangle$ Intelligence $\propto$ $\triangle$Volume of Space

In time this mathematical relationship could be tested. Once we know the rate of universal expansion and the rate that intelligence is evolving, then this could be accomplished. Before we pursue this relationship, let us first better define our present concept of space.

Our conceptual picture of space has been evolving as more quantum phenomena are identified. Space is no longer seen as a void or pure vacuum. Virtual particles are believed to be constantly coming into existence temporarily out of empty space and then fading back into oblivion. These ghost particles cannot be seen, although they do seem to leave their physical traces. Thus, what might appear to represent empty space is actually a seething ferment of virtual particles (Ref. 5.3) springing forth from the infinite vacuum energy that is diffusely distributed throughout space. According to Paul Davies,

"Mathematical modeling suggests that, on the scale at least 20 powers of 10 smaller than an atomic nucleus, space becomes `foamy' in structure, with violent, spontaneous growth and decay of curvature". (Ref. 5.4)

The concept of how space and matter interrelate has also been evolving. Einstein regarded matter as extremely intense concentrations of energy or local condensations of the quantum field. He believed that there was no matter as such, but that the field could take the form of quanta or particles. In the quantum field theories, the distinction between solid particles and space surrounding them is entirely lost. The field represents the fundamental physical entity as a continuous medium which is present everywhere throughout space. (Ref. 5.5) A material particle such as a proton or electron is considered to be a small domain

of the electrical field within which the field strength assumes enormously high values. (Ref. 5.6)

The becoming and fading of particles are simply forms of motion of the field. (Ref. 5.7) Space, therefore, is a living void pulsating in endless rhythms of creation and destruction.

The concept of how space and energy interrelate has been partly summarized by David Bohm. He believes that space contains an immense background of energy, which we avoid in our mathematical calculations. Background energy is ignored by calculating only the difference between the energy of "empty" space and that of space with matter in it. (Ref. 5.8) He also describes space as a plenum, after the Greek philosopher Zeno, and states that it "is the ground for the existence of everything, including ourselves". (Ref. 5.9) Bohm also describes space as a "holomovement," containing an immense sea of energy with interspersed matter that is to be treated as a comparatively small pattern of excitation. (Ref. 5.10) He believes that "consciousness is no longer to be fundamentally separated from matter." Matter is the object of our consciousness. (Ref. 5.11)

The concept of how space and the forces of nature interrelate has been suggested by Paul Davies. He has stated that the new unified field theory as it is evolving would suggest that "all the forces of nature, not merely gravity, are treated as manifestations of space-time structure. What we normally call gravity is a warp in the four space-time dimensions of our perceptions, while the other forces are reduced to higher-dimensional space warps. All the forces of nature are revealed as nothing more than hidden geometry at work". (Ref. 5.12) It needs to be emphasized that he conceives that all of the forces of

nature are manifestations of space-time structure. This correlates with the concept that intelligence is also an attribute of space-time structure,

thus giving evidence of a fundamental relationship between the forces of nature and intelligence.

Space is seen to contain many fields such as occur with electricity and magnetism. A field represents an "invisible halo of influence emanating from matter and extending through space". [Ref. 5.13] Gravity is also a type of field which is more far-reaching than others. Every particle in existence, even including energy, is influenced by gravity and every particle is a source of gravity. [Ref. 5.14] All particles couple to the gravitational field, but only charged particles couple to the electromagnetic field. [Ref. 5.15]

Other theoretical models of space have been postulated, and many more will come; however, what seems to be a recurring concept is expressed by D.E. Thomsen. "In the view of modern cosmologists, space has properties similar to those of matter. It can be stretched, compressed, curved and twisted. It can also undergo phase changes analogous to freezing or boiling, and those phase changes can leave behind topological defects like the defects and dislocations that sometimes occur when crystals form. One theory of relatively recent origin suggests that in the case of space, these defects are strings that form closed loops. These strings allegedly generate strong gravitation effects". [Ref. 5.16]

The more we learn about space, the less like a vacuum it becomes. In addition to the ingredients already mentioned, radio astronomers have detected an ever-increasing list of organic molecules in interstellar space, including: cyanogen (CN), carbon monoxide (CO), hydrogen cyanide (HCN), formaldehyde (H_2CO), formic acid (HCOOH), methanol (CH_3OH), acetaldehyde ($HCOCH_3$), and methyl formate ($HCOOCH_3$). [Ref. 5.17]

Time is intimately related to space and is truly a fourth dimension in every sense of the word. Our mind allows us to perceive time differently from the other three dimensions; however, if the concept of mind is

erased, then time becomes a measurement of distance, which then would allow for the calculation of volume change of space in an expanding universe. This will be illustrated later.

Time is relative according to relativity theory, and if we could travel back to the origin of the universe we would find that the pace of events would quicken. The farther back we go, the faster things happen. (Ref. 5.18) Time is slowed

by a gravitational field, so that it flows more slowly in a valley than on a mountain peak. It also flows more slowly on the surface of the sun than on earth. (Ref. 5.19) Time slows also for any object in motion as it approaches the speed of light.

Prior to the last century, before the Michelson-Morley experiment, it was commonly believed that space contained an invisible ether. The results of this experiment tended to rule out the presence of any ether-like substance. However, there has been a recent resurgence of the ether concept as it relates to space, and at least a part of this is based on experimental work performed in 1979 by Stefan Marinov, a Bulgarian physicist. He ingeniously measured the one-way speed of light and, depending upon the direction he aimed his apparatus, obtained different speeds. This of course contradicts the century-old Michelson-Morley experiment, which purportedly demonstrated that the speed of light is constant. Their work was based on reflected light traveling over and back (two directions), which could have canceled out any intervening medium. If Marinov's experiments are supported by additional research, then the need for some type of medium in space, "ether," becomes necessary to reality. (Ref. 5.20)

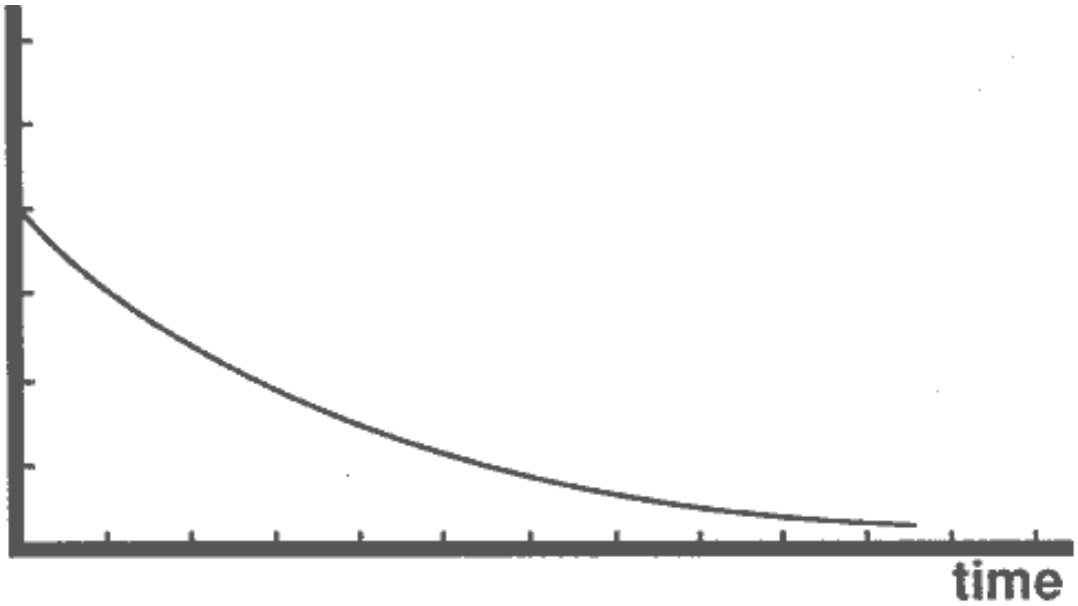
Paul LaViolette has developed a new theory of subquantum kinetics. This general systems theory remodels the classic concept of ether in space to represent a reactive flux. He conceives of space as being comprised of unimaginably small units that when concentrated together

form matter. If it is eventually determined that there is an ether-like substance present in space, then this could modify our views about spatial expansion. For one thing, it gives rise to an alternative interpretation of the red shift phenomenon associated with distant stars and galaxies. The presence of ether might cause the red shift, rather than the recession of celestial objects. (Ref. 5.21)

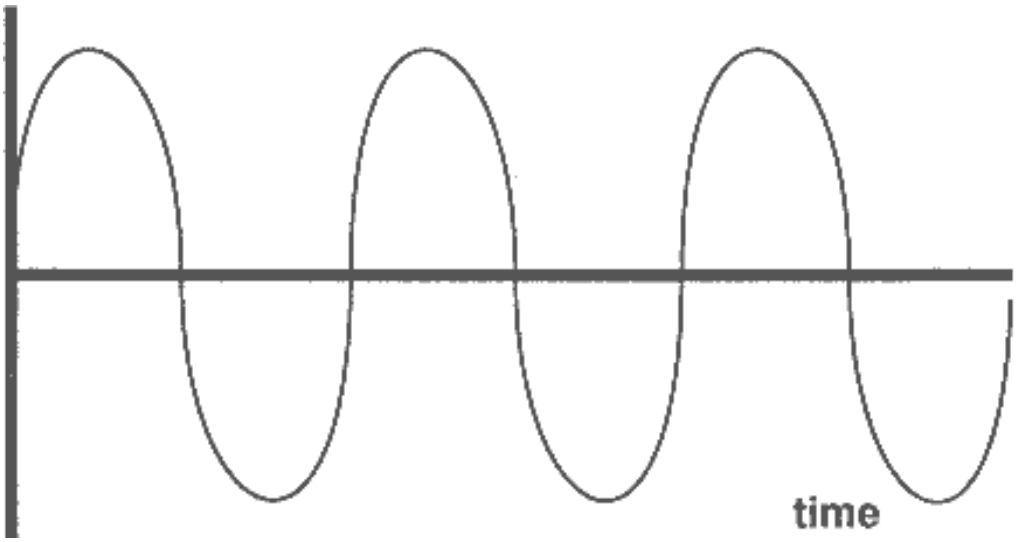
Of the various predictions made by the Integrated Theory of Intelligence, the one which is most central is that intelligence has evolved non-linearly and will continue to do so hereafter, at least as long as the universe is in a state of expansion. Intelligence, which includes consciousness, is space-related--that is, it occupies space. Intelligence (consciousness) can only evolve if space is expanding. Present-day theory suggests that the universe is doing just that. This conclusion is based on the Doppler effect, which is an observed phenomenon that the frequency of a wave that reaches an observer from a given source decreases with the speed at which source and observer move away from each other. Since light reaching us from other galaxies is shifted to the lower frequencies, it is seen as a red shift and suggests that stars are receding away from each other. The estimated recession velocity is correlated with the brightness of the celestial object. The fainter, more distant objects seem to be receding faster than those that are closer. (Ref. 5.22) The farther away a galaxy is from us or some other galaxy, the faster its recession velocity. At double the distance, the recession velocity also doubles. All galaxies are moving away from each other. Nearby galaxies are moving several thousand miles per second relative to each other. The farthest galaxies are moving away from each other at velocities approaching the speed of light. (Ref. 5.23) It has also been suggested by some cosmologists that light from galaxies even farther out will never reach us because they are moving away from us faster than the speed of light. (Ref. 5.24) This of course contradicts present-day theory, which suggests that no form of matter or energy can exceed the speed of light.

The Exponential Curve

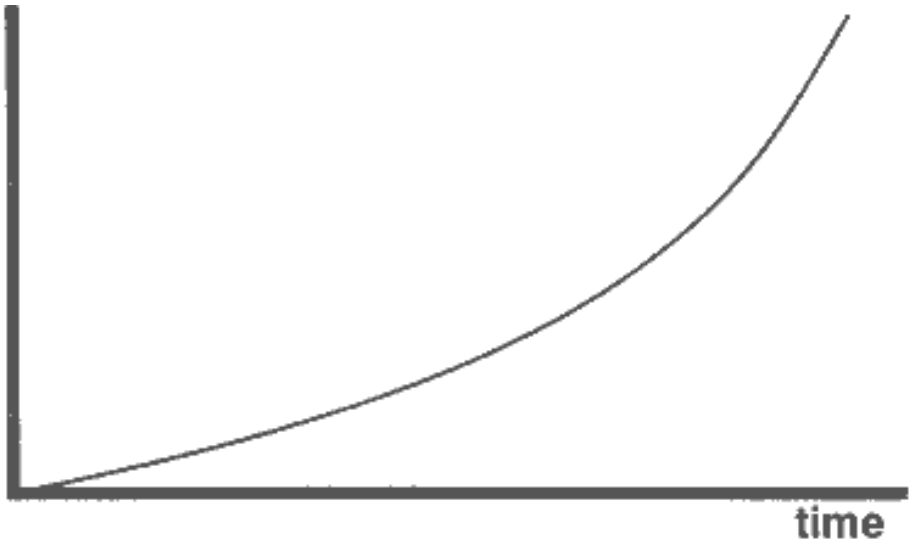
Before we go further, there is a need to understand the term "exponential" so that the formulae and graphs presented in this text will be better understood.

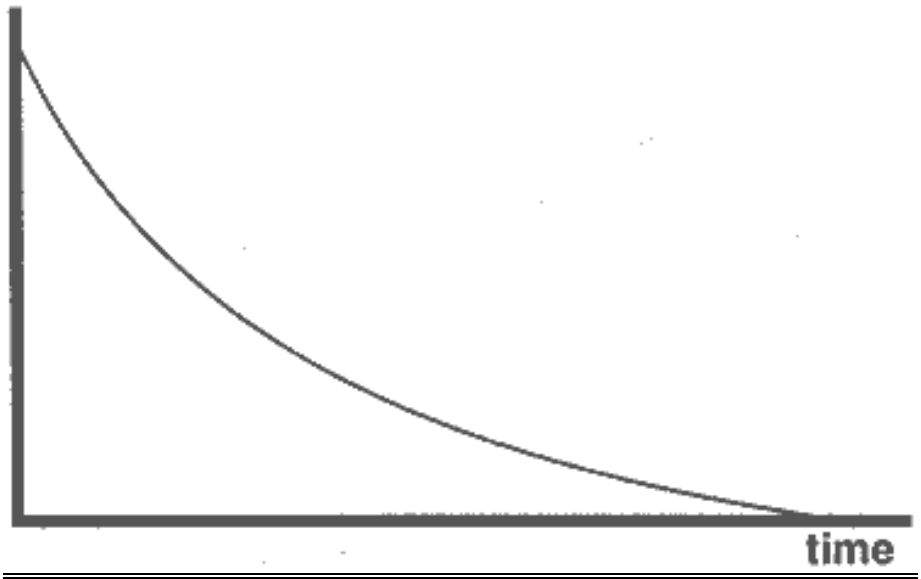


The shape of exponential curves encodes deep mathematical properties that recur in a wide range of physical situations. An exponential curve is one that is everywhere equal to, or at least proportional to, its own slope. The exponential function is one of the most elegant mathematical relationships known to humankind, because an exponential curve can represent part of a sine wave, and physical systems which display exponential behavior may also display periodic sinusoidal behavior. This is important to the present discussion, since the exponential curves that are being presented could easily be the initial sweep of a sine wave curve, if the universe is cyclically undergoing expansion followed by contraction. The sine wave differs from an exponential curve in that it periodically and regularly goes up and down:



Whereas the exponential curve continuously always rises faster and faster or falls slower and slower: (Ref. 5.25)





There are other non-linear functions which will produce curves similar to the exponential-curve, but with different slopes. These would include quadratic, cubic and quartic, reflecting equations of degrees 2, 3 and 4. Each successive slope of higher-degree formulae would be steeper than the last.

The most important concepts to be gained from this brief discussion pertaining to exponential curves are:

(1) All physical processes occurring in our known universe, including entropy, are doing so at an exponential rate.

(2) The curve itself reflects a process which is either accelerating or decelerating at a constant specified rate.

(3) An exponential curve can represent the initial sweep of a sine wave, so that all concepts presented here would fit either the model of an open universe which will expand forever, or one that is oscillating cyclically.

The concept that evolving intelligence is related to universal expansion can be expressed mathematically:

$\triangle In = (\triangle \text{Volume of Space})(K_2)$

$\triangle In$ = Change (increase) in intelligence

K_2 = Constant variable which could be unity (1) and cancel out of the equation; but which, however, might not, dependent upon what other properties, yet to be defined, might also be contained within space which compete with intelligence for space. For example, does matter expand to fill space as space itself expands? Is there more to space

than we yet realize, so that in the absence of any matter, space is still not a vacuum? Do forces in action across space compete for any of the volume?

△Volume of Space = Change in volume of space per unit of matter for the same period of time that the change of intelligence is measured.

Space needs to be more specifically defined as follows:

$Space_c = Space_1 + Space_2 + Space_3$

$Space_c$ = Total space in closed universe.

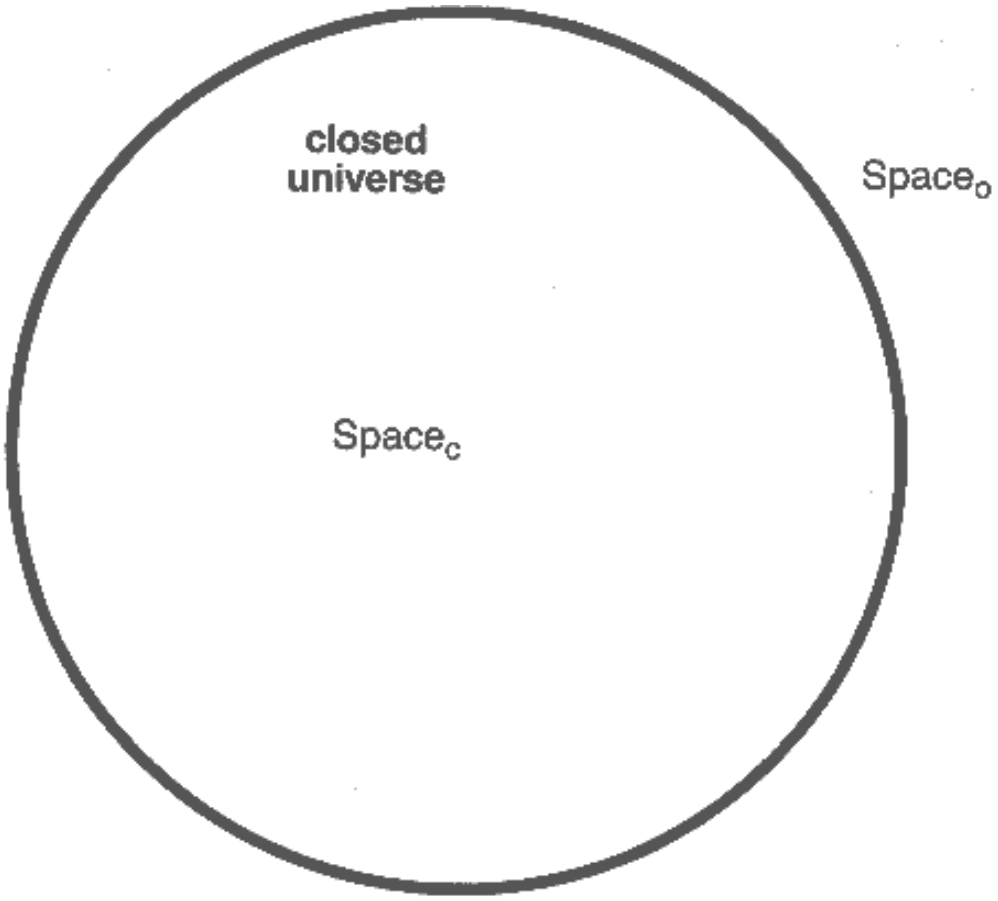
$Space_1$ = All of space excluding that portion containing matter (mass + energy).

$Space_2$ = That fraction of space occupied by matter-energy.

$Space_3$ = That fraction of space which might contain potential unknowns (i.e., forces in action that might conceivably occupy part of space, or other unknowns).

Differentiation should also be made between $Space_c$ in a closed universe and $Space_o$ in an open universe.

I would confine intelligence to a closed-universe system for the purpose of discussion and state the following:



Space$_c$ = Any space included in our universe that contains matter and energy as well as intelligence.

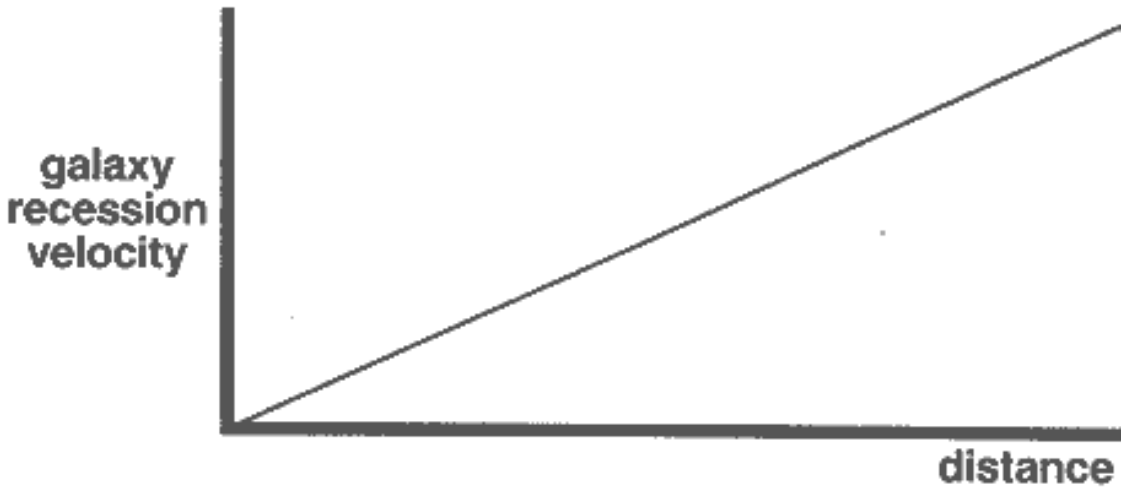
Space$_o$ = Total vacuum, void of matter, energy or intelligence.

This mathematical concept is theoretically and potentially testable. The rate of expansion of the universe would need to be known. Is it expanding constantly at the speed of light? Is it slowing down due to gravity in anticipation of an eventual cyclical contraction phase? Is it expanding at a continuously faster exponential rate with the peripheral galaxies exceeding the speed of light, or is it expanding at some other yet-to-be-determined rate? Many, including myself, would like to believe that it is slowing down and will someday undergo a contraction phase as part of a continuous waveform pattern. The Integrated Theory

of Intelligence does not require any specific model of expansion, only that the volume of space is increasing in some fashion at this time.

Since the manifestation of intelligence, as we experience reality, requires a close interrelationship and interdependence with matter-energy, one might speculate that only space which contains matter is relevant to the evolution of intelligence. The space within our observable universe contains galaxies of matter which are moving away from each other. They appear to be receding in such a fashion that as they double their distance relative to each other, they are traveling at twice the speed. (Ref. 5.26) The galaxies that are farther away from us are traveling faster than those which are closer.

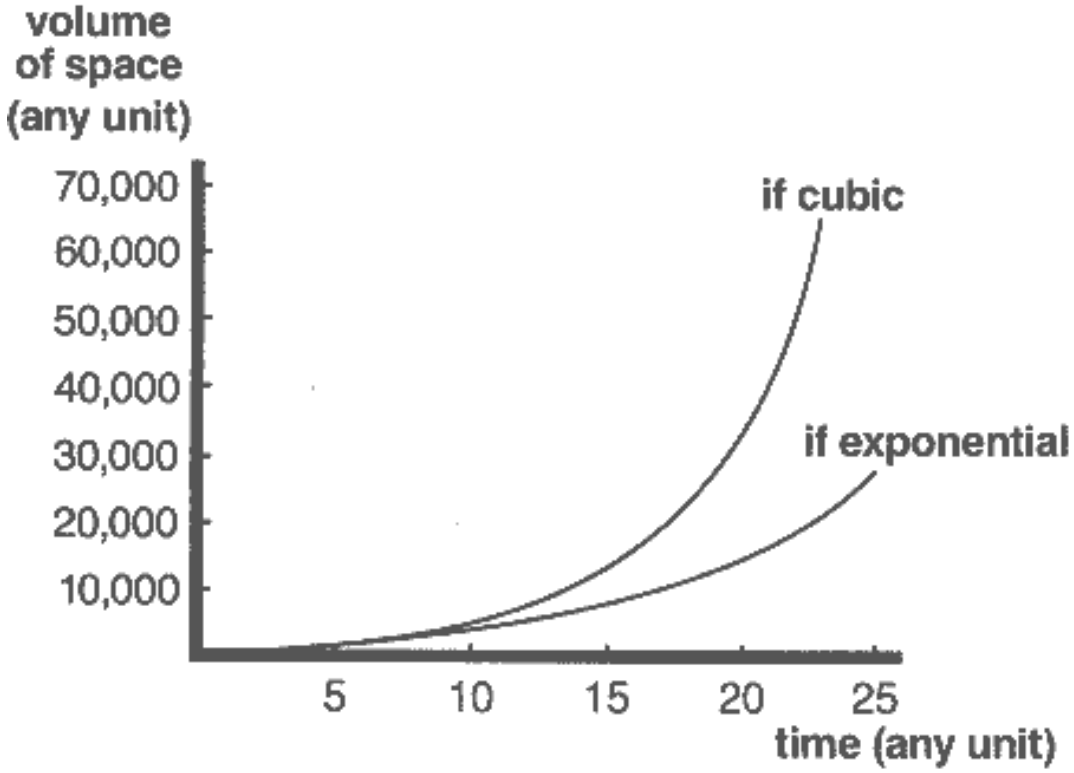
If one constructs a graph illustrating this phenomenon by comparing the velocity of galaxy recession relative to the distances that separate them, the resulting line is a linear function. At double their distance from each other they are moving at twice the speed.



This assumes that all galaxies are traveling at essentially the same velocity at which they were initially set in motion, or perhaps are undergoing a uniform gradual slowing or acceleration.

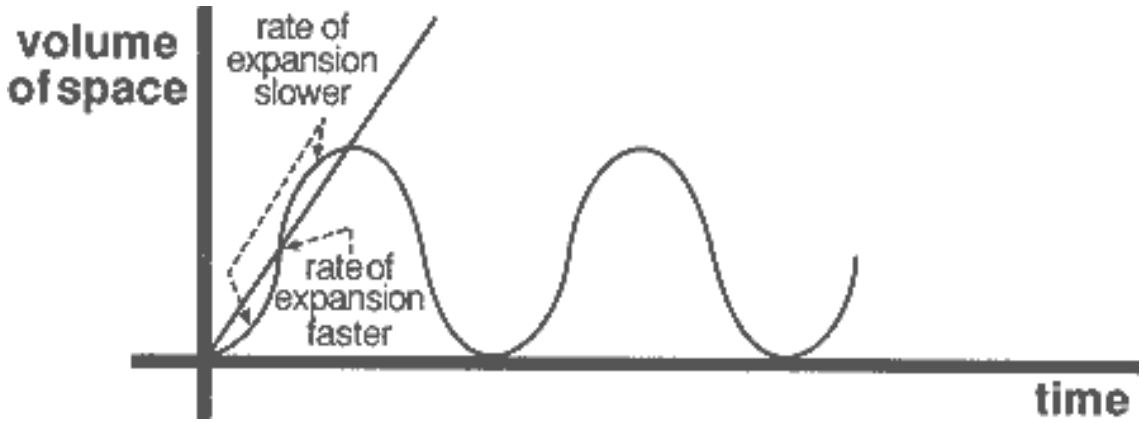
The volume expansion of the universe does display non-linear behavior if one plots its volume increase against time. A typical non-linear curve is produced which is similar in nature to the exponential decay curves that reflect all entropic processes.

If the universe is expanding at a uniform rate (galaxy recession velocity is neither increasing nor decreasing) then the volume of space is increasing as a cubic function rather than exponential. This would mean that the rate of volume expansion is somewhat faster than if following an exponential curve.



For the volume of space to be increasing exponentially would require that the rate of spatial expansion be decelerating slightly relative to a uniform velocity. This is not an impossible occurrence if two conditions are assumed. The first assumption is that our ability to measure the actual rate of expansion is only approximately correct. The universe could be expanding slightly slower or faster than a perfectly uniform

rate. It may not be a linear function. The other assumption is that the universe is closed and therefore cyclic, undergoing periodic expansion and contraction. In this situation, depending upon where on the curve we presently find ourselves, the rate of expansion could be either faster or slower than a straight linear function. If one compares a cyclical curve (sine wave) with a straight linear function expression, as illustrated below, the rate of expansion could be faster or slower than that linear rate.

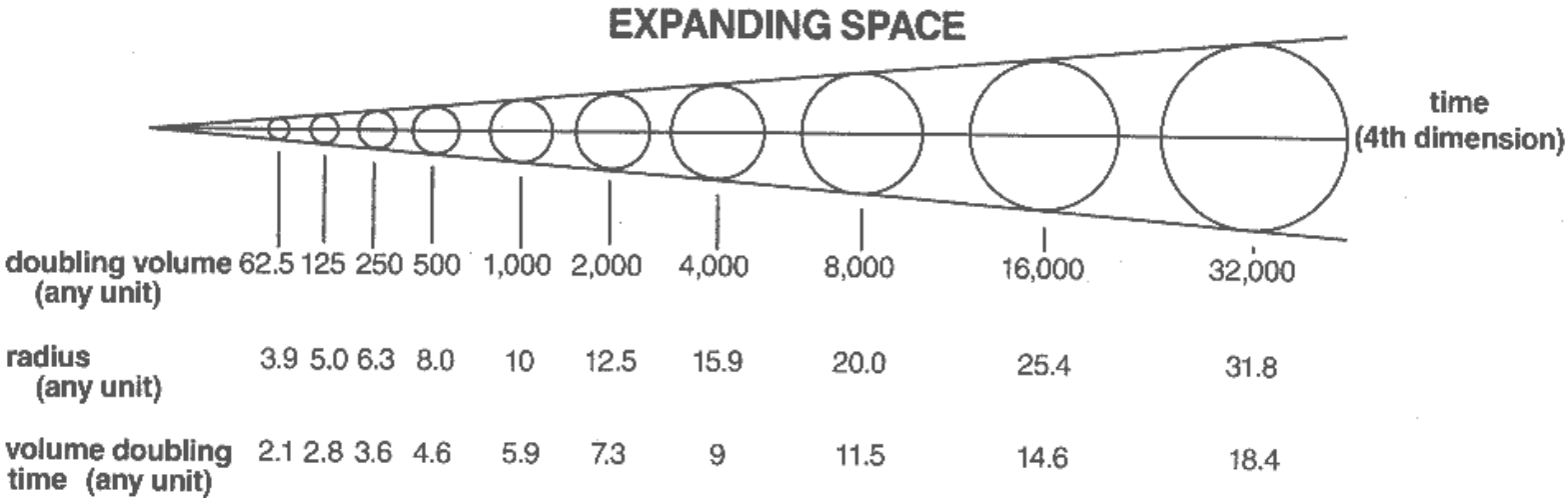


If the rate of expansion (galaxy recession velocity) were to fall on the middle part of the upward sweep of the sine wave, then the rate of expansion would appear to be accelerating relative to the predicted uniform rate. If the rate of expansion were to fall on the initial or terminal portions of the upward curve, then the rate of expansion would appear to be decelerating relative to the predicted uniform rate. It therefore is theoretically possible that the volume of space could be expanding exponentially rather than as a cubic function.
If the expansion of the universe were slowing down at just the precise rate, then the rate at which the volume of space was expanding could also be exponential. This would best fit the most elegant of relationships, showing the interdependence of the expansion of the universe with all entropic processes which are also occurring

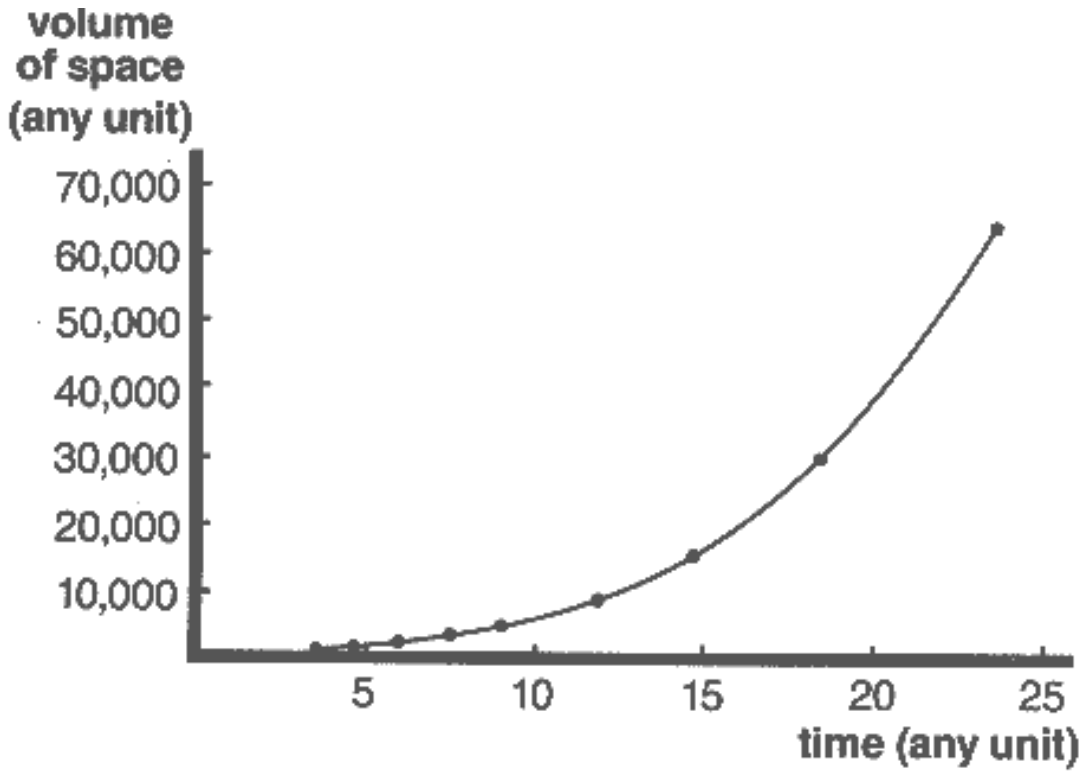
exponentially. It might also allow us to eventually calculate the rate at which the process of universal volume expansion is slowing.

For the rate of universal expansion to be slowing, there must be dark matter within the universe in the appropriate quantity. There is in fact a substantial amount of indirect evidence accumulating which would suggest that there very well might be enough dark matter to cause this to occur. (Ref. 5.27) If so, the universe would ultimately be shown to be cyclic, undergoing phases of expansion followed by contraction.

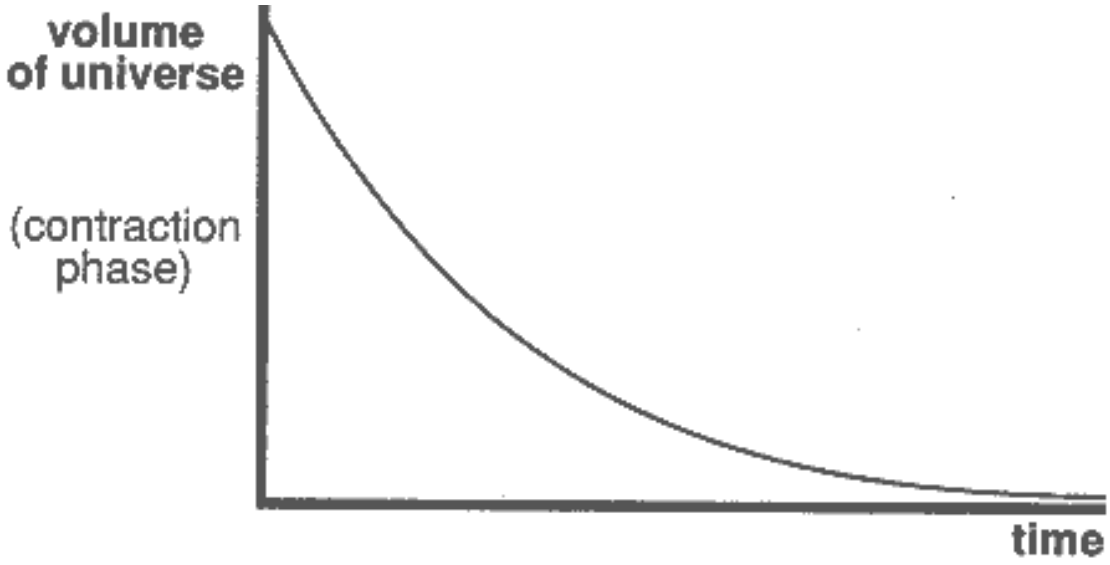
These calculations also assume that time is constant, which in actuality may not be the case; and that the universe can be mathematically represented by a sphere, which could also be questioned. A diagram of a sphere expanding at a constant rate shows how the volume doubling time is continuously changing. Each time the sphere doubles its volume it takes a longer time interval to accomplish this feat.



If a graph is constructed, a cubic curve can be demonstrated that is similar to an exponential curve, but with a slope that rises more quickly. On the vertical (Y) axis, each point represents the universal volume each time it doubles; and on the horizontal (X) axis, each point represents the time required for the universe to double in volume.



If this process were reversed, reflecting a universe undergoing contraction at a steady rate, then a cubic curve would be produced similar to an exponential curve, but falling more quickly. Again, either curve could become an exponential curve under the proper conditions if the rate of expansion or contraction were occurring at the prescribed non-linear rate.



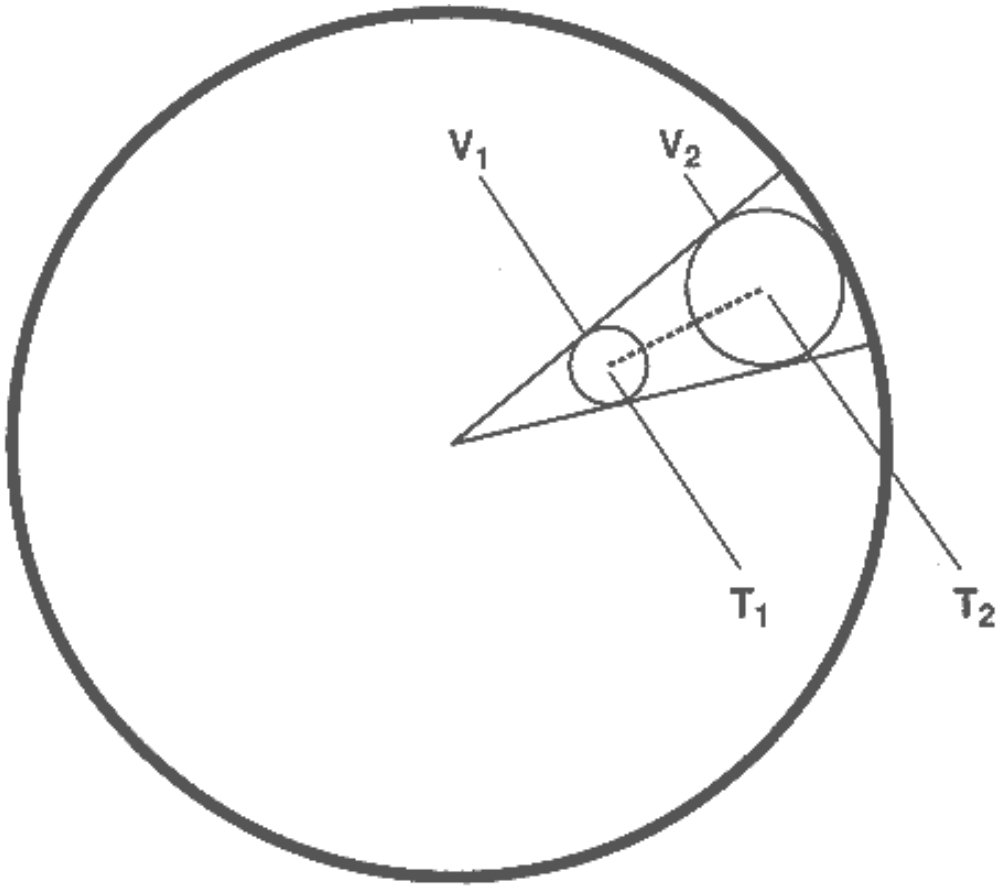
If the assumption is made, which I am convinced is correct, that there is an interrelationship and interdependence between the entire entropic process of the universe and the universal expansion of space, then what must be the rate of universal expansion to allow entropy to occur at an exponential rate? As suggested before, it makes a more elegant relationship if spatial volume is expanding exponentially, even though this might not be a necessary precondition.

Since intelligence is also evolving in non-linear fashion, it becomes tempting to speculate that this process is also occurring exponentially, particularly if one intuitively believes in the interrelationship of all things and processes. The non-linear evolution of intelligence will be examined in the next chapter.

Although this is not the way that most cosmologists would see the universe, a model could be constructed which envisions multiple adjacent universes, all of which are periodically expanding and contracting in waveform fashion. As some are expanding, others that are immediately adjacent must necessarily contract. This might look something like pulsating foam. Our universe could presently be in a state of expansion somewhere on the upward sweep of the curve.

The big-bang event is not seen so much as an explosion beginning from a definite center, but more like a carefully orchestrated expansion which occurred simultaneously everywhere, filling all of space from the beginning and with every particle of matter receding from every other particle. The present end result is manifested by all galaxies moving away from each other, as previously indicated. (Ref. 5.28)

To be able to determine the amount of volume increase of space, one can arbitrarily choose a known volume of space at a specified time, and then calculate the new increased volume after a known time interval, assuming the rate of expansion is known.



$Volume_1$ = Initial Volume of Space
$Volume_2$ = New Volume of Space after specified time period of expansion.

$T_2 - T_1$ = Known time interval which is easily converted to a known distance traveled during the expansionary phase, if the rate of expansion is known. This time interval or distance represents the fourth dimension.

It becomes more difficult to calculate the rate at which intelligence is evolving, and at this point in time it is probably not even possible. Ideally one would first determine the total intelligence content of the universe, which obviously is not possible, and then observe this known quantity for a specified period of time to determine any change. The second most ideal way, which would be less accurate but perhaps still accurate enough, would be to determine the total intelligence content present on this planet at T_1 and then again later at T_2. This is also far beyond our present level of technical achievement, but in time might be possible. First it would be necessary to devise a way to accurately determine the quantity of intelligence in all existing organisms. Even if there were a comparative way to determine the level of intelligence in each organism, it would be an awesome task to establish the population census that would also be a necessary prerequisite. One might conceivably compare the number of bits of information stored in the DNA molecules of each animal species as a way of measuring the intelligence quotient, since information content should be proportional to the level of intelligence. The following mathematical expression would be one way of calculating the total intelligence content of this planet.

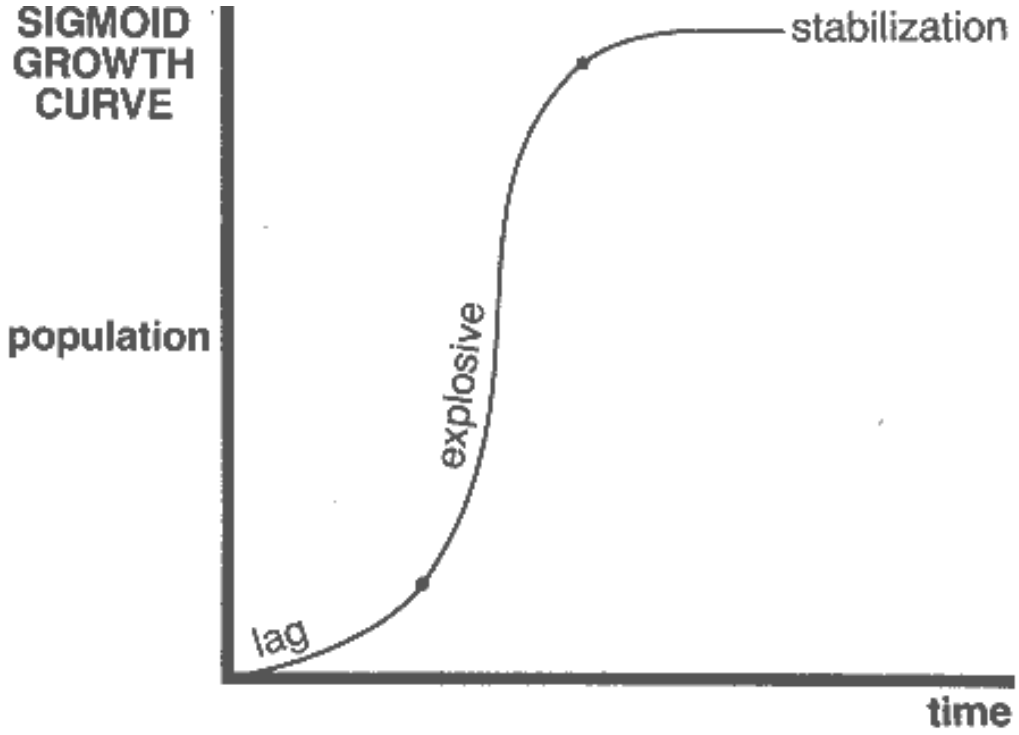
$$\mathbf{In_{tot} = ({}^{In}ave_1)({}^{\#}Org_1)+({}^{In}ave_2)({}^{\#}Org_2)+({}^{In}ave_3)({}^{\#}Org_3)+...etc.}$$

In_{tot} = <u>Total Intelligence</u> content of earth.

In_{ave} = <u>Average Intelligence</u> of each individual species that exists on earth.

$^{\#}Org$ = <u>Number of organisms</u> in each individual species.

If the universe were not expanding, then intelligence would not be evolving, since the expansion or growth of any species of organism is limited to available space. This concept can be nicely illustrated by witnessing the growth of a bacterial colony and the type of sigmoid growth curve generated. An increase in population is slow at first, even though the amount of time required for cellular division remains unchanged (approximately 20 minutes per division). The founding cells are few in number and form the "lag" phase on the curve. As multiplication occurs, the population growth enters the "explosive" or log phase where there is a very rapid increase in total number of bacteria. Because space is limited, the colony growth reaches a "stabilization" phase. If there were no stabilization through loss of nutrient, the bacterial colony in time would fill the entire universe. (Ref. 5.29) Prior to the stabilization phase the curve is exponential and would continue to be, if not for the loss of nutrient.



As long as the universe continues to expand, this expansion removes any limitation to the upward evolution of intelligence. If on the other hand the universal motion is cyclic, undergoing phases of expansion and contraction, this would suggest that intelligence or consciousness would likewise undergo a contraction phase, perhaps similar to a state of hibernation.

Again, these three processes are seen to be interdependent, just as quantum theory has come to see the universe as an interconnected web of physical and mental relations whose parts are defined only through their connections to the whole. This interdependence is seen as strong evidence that intelligence has been present from the very beginning of time. Again, the inseparable interdependence of intelligence, matter-energy and space-time is illustrated and stressed.

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Chapter 6

Importance of Natural Selection Upon the Evolution of Intelligence

4) There has been an evolution of intelligence toward increasingly complex states that has occurred non-linearly through natural selection, resulting in greater information storage and more complex organisms.

Where did intelligence come from? It either pre-existed our current inflationary expansion of the universe, originated at the moment of onset of expansion, or evolved afterward from some potential proto-intelligence. Any conclusion that we might draw at this moment of existence would be speculative; however, I would tend to believe that intelligence has probably always existed in some form. The least difficult explanation of its origin for me to accept, whether correct or not, is based on a cyclical oscillating universe without beginning or ending limits. Nevertheless, I cannot reject the possibility that the current expansion has been a one-time phenomenon.

What does seem rather definite is that there must be some positive force which is pushing the upward movement of intelligence to higher and higher states of consciousness as it relates to material existence. Natural selection has been important as an editor of this process but cannot by itself account for it. One well-established physical principle indicates that a continually constant force applied to an object results in the latter's continued acceleration. Once that force no longer exists, the object will

travel at a constant velocity without acceleration. Since there can be no doubt that the process of evolution, and more specifically the evolution of intelligence, is continuously moving upward at an accelerated rate, this would imply that some positive force must be present.

The evolution of increasingly complex organisms has occurred non-linearly, but it has yet to be established whether the curve reflecting the upward evolution of intelligence is quadratic, cubic, quartic, exponential or of some other function. The rising end of the curve is now steeply oriented, reflecting the continued relatively rapid increase of intelligence. Even now there is evidence, which will be presented below, that intelligence continues to evolve in an upward direction. This theory predicts that this evolution of increasing intelligence will continue even though we have successfully reduced those factors that traditionally have been viewed as being naturally selective for humankind.

Through better medicine and greatly improved technology we have been able to care for those imperfect humans who otherwise would have died because of natural selection factors, but who now can reproduce and keep the gene pool alive with substandard genetic material. Even though the forces of natural selection have been rather dramatically modified, so that in many countries the less intelligent individuals may be out-reproducing the more intelligent people, this theory predicts that the mean intelligence level will still continue to rise worldwide. To support this conclusion there is substantial evidence already in existence, and it will be presented later in another section. However, it should also become increasingly clear that this continuing upward movement of intelligence is in fact happening as more time passes.

Since Charles Darwin presented his theory of evolution more than one hundred years ago, some modifications based upon more recent

observations have become necessary. Darwin saw a world where, "All nature is at war, one organism with another or with external nature." He perceived a continual struggle for existence, with the strongest, the swiftest and the most cunning surviving over the weaker organisms. (Ref. 6.1) Although competition among species does exist, there would actually appear to be a great deal of cooperation going on as well. Some present-day biologists believe that there is much more cooperation between animals than competition. (Ref. 6.2) There seems to be more of a peaceful coexistence among most animals and plants, which have a very great number of symbiotic relationships. (Ref. 6.3) Nature is now seen to be an alliance founded on cooperation.

The process of evolution may not be the slow, gradual course that Darwin envisioned. There are those such as Gould and Eldredge who now propose the theory of "punctuated equilibria" which suggests that speciation occurs in jumps. (Ref. 6.4)

None of the newer concepts about how evolution occurs affects the integrated theory of intelligence. It fits well with any of the concepts in existence.

This upward evolution of intelligence can best be appreciated by looking at the cosmic calendar and constructing a graph plotting the paleontologists' estimates of various arrival times of different life forms against each organism's estimated relative intelligence. Although each point can only be approximated, the resultant curve is clearly non-linear, with only the slope of the curve in question. It actually may even be exponential (See figure 1 on next page).

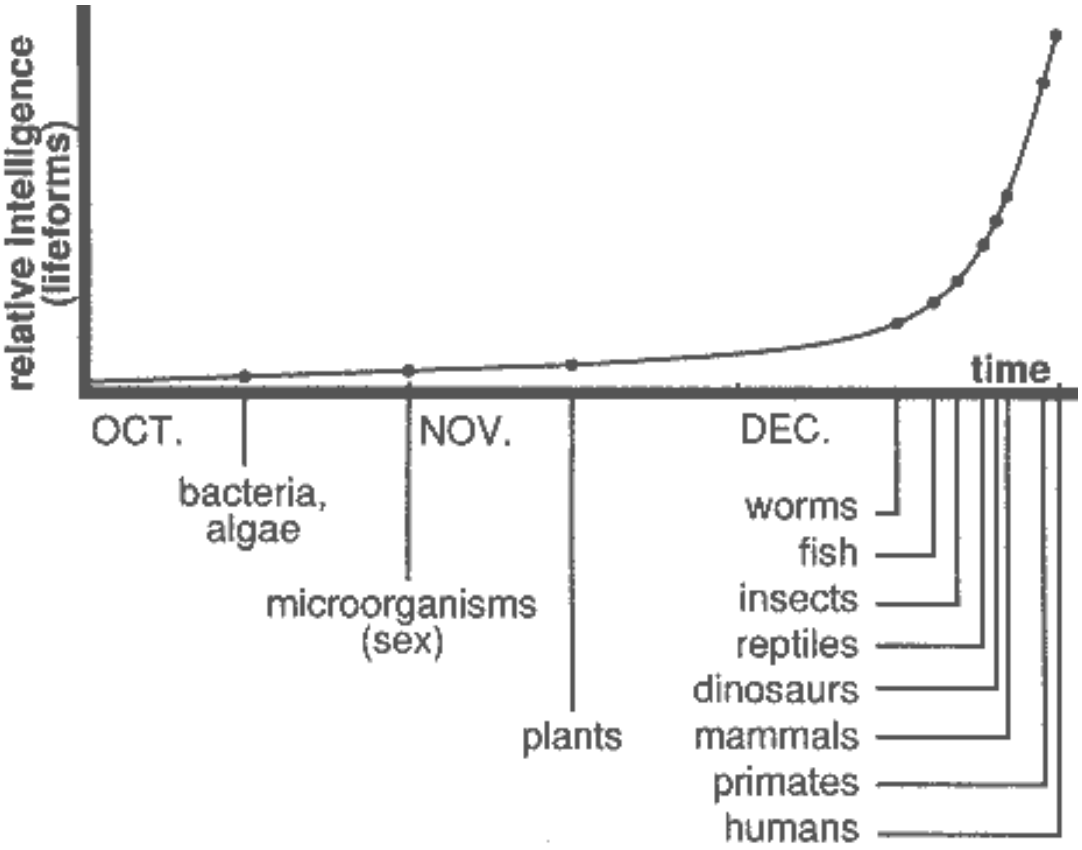


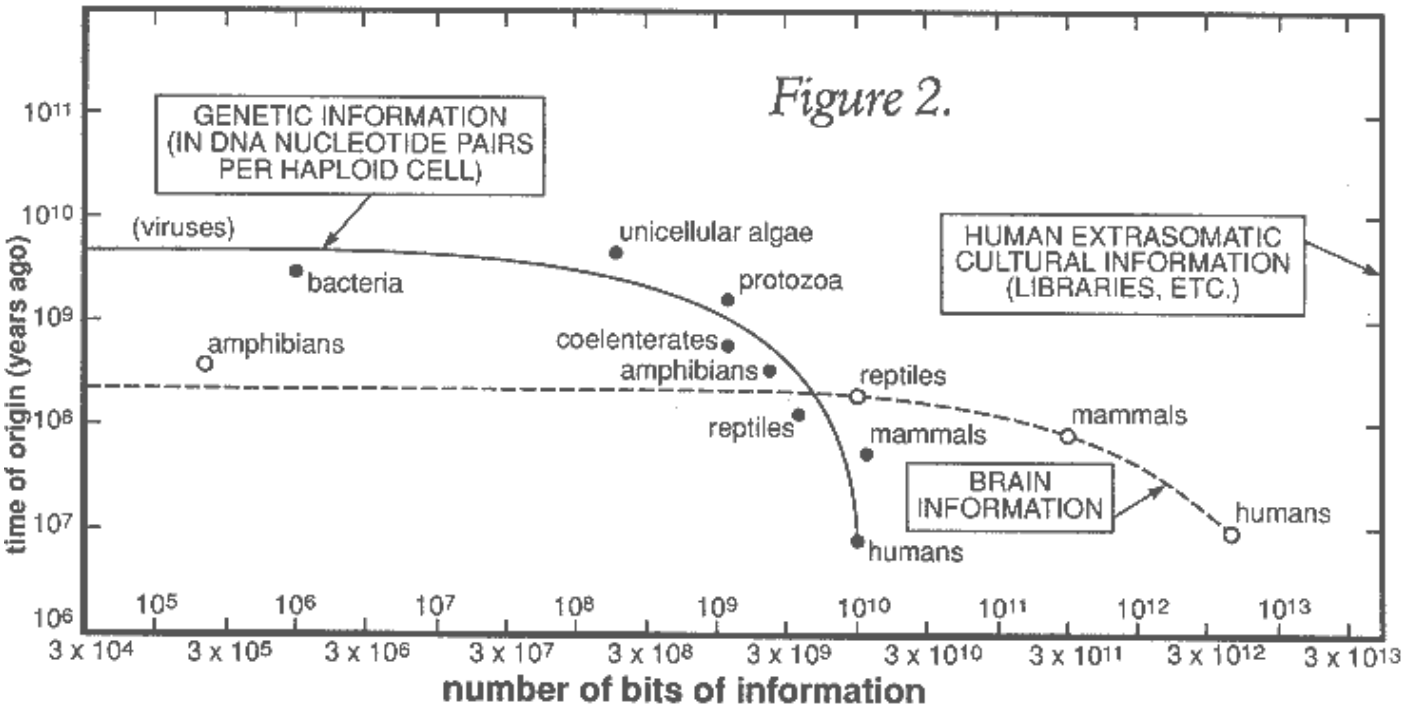
Figure 1.

The simplest life forms were in existence for a few billions of years as they very gradually developed into intermediate forms. With the progression of time, organisms gradually accelerated in their degree of complexity.

If the entire history of the universe were compressed into a single year, then the origin of life on earth would have occurred around the last of September and the entire recorded history of man would occupy the last 10 seconds of the year. The first worms would have appeared on approximately December 15, the first fish and vertebrates on December 19, first insects on December 21, first reptiles on December 23, first mammals on December 26, first primates on December 29, and the first humans on December 31. [Ref. 6.5] (See Figure 1)

The non-linear upward evolution of intelligence is also manifested by tracing the continued increase in information as seen during the history of life on earth. This can be plotted on a graph in two ways, as suggested

by Carl Sagan. The solid curve represents the number of bits of information contained in the genes of various taxa, whose time of origin in the geological record is also roughly indicated. The dashed curve represents an approximate estimate of the evolution in the amount of information in the brains and nervous systems of the same organisms. (Ref. 6.6) Both curves are clearly non-linear (See figure 2).



Intelligence didn't suddenly appear in man as something new that had never existed before. Its development was a very long, slowly evolving process which has become increasingly rapid as time has progressed. It exists in all living tissue. It did not just suddenly appear in higher animal forms, but has been present, even though very simplistically, from the very beginning. It was present in the most simple of molecules which first found themselves reproducing. The level of intelligence was extremely simple relative to that found even in the simplest animals of today.

Intelligence began its upward evolution when it first started being selected out of the most primitive of living structures as each "proto-organism" became capable of recognizing those sorts of basic ingredients it required for survival. This precognitive recognition began through natural selection with the initiation of life. The simplest of reproducing molecules in the primordial soup survived best if they were made of those ingredients which were abundantly available to them. There must has been an abundance of certain elements (C, H, O, N, etc.) and of amino acids for life to have formed in its present state. The proto-organism's ability to recognize which elements and amino acids it required for replication and survival was a manifestation of primitive intelligence. This ability to recognize what ingredients were required for reproduction and survival became increasingly complex as more information became programmed into these complex molecules or proto-organisms.

The existence of chaos has directly influenced the non-linear evolution of intelligence. According to physicist Paul Davies, linear systems display the characteristic that the whole is approximately equal to the sum of its parts. By contrast, in non-linear systems the whole is greater than the sum of its parts, and cannot be reduced or analyzed in terms of simple sub-units acting together. (Ref. 6.7) Chaotic systems are non-linear.

As previously stated in the discussion pertaining to the science of chaos, very small differences in the initial conditions of any system will produce very great differences in the final phenomena. A small initial error will produce an enormous final error. Any errors in an ordinary dynamical system will grow in proportion to time at a linear rate. By contrast, the growth rate of errors in a chaotic system is exponential. (Ref. 6.8)

Chaos endows any system with a random element of freedom to explore a vast range of alternative pathways and behavior patterns. Although

chaos can result in destruction of a system, it also allows for the creation of new and innovative structures. (Ref. 6.9) The exponential growth rate of errors in any chaotic system leads to the creation of systems of greater complexity at an exponential rate. This helps explain why evolution of the universe and its life forms has also probably occurred at an exponential rate.

Since the natural entropic process resulted in alterations in proto-organisms, there were occasional changes which enhanced each molecule's chance for survival. This "increased fitness" became part of the intelligence system and improved its chance for survival. So began a very long, slow evolutionary process of intelligence which has progressed to what we presently see in man. Although it cannot yet be determined what the non-linear rate of evolution of intelligence has been, I would favor an exponential process for the reasons indicated above.

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Chapter 7

Intelligence As a Continuum Manifested through Simple to Complex Forms

(5) In lifeforms, intelligence is manifested across a wide spectrum and can even be viewed as a continuum with man at the upper end and the most basic and simplest lifeforms at the lower end. This is illustrated in the table below; however, it does not include all facets of intelligence; also, the order in which each is listed could be altered. The table illustrates the concept of how intelligence should be considered as a continuum. The following list is ordered in ascending complexity.

Intelligence Spectrum

(A) "Precognitive" recognition of numerous types, resulting in molecules or organisms of increasing complexity. (Intelligence operating on molecular or microscopic level.)

(1) First reproducing molecules (proto-organisms); recognition of what atoms and molecules were needed for reproduction and survival.

(2) DNA reproduction (molecules seeking atoms and molecules).

(3) Recognition that increased complexity enhanced chance of survival because it allowed organisms to be preprogrammed in advance with more information (rules and advice) to cope with a greater number of unpredictable eventualities.

(4) Recognition that an outer protective shell gave added protection and enhanced chance of survival.

(B) Unconscious body function; some examples include:

(1) Assimilation and conversion of energy.

(2) Development of enzyme systems (some systems, such as Cytochrome C., transcend all life forms.)

(3) Absorption of nourishment.

(4) Excretion of waste material.

(a) Renal filtration and excretion.

(b) Liver metabolism and excretion.

(5) Temperature regulation.

(6) Reproductive function (sperm and ovum production).

(7) Immune system recognizing harmful invading organisms and killing them.

(8) Blood cell production in bone marrow or extramedullary hematopoiesis.

(9) Endocrine system--glandular functions of every type.

(10) Higher plant functions. Evidence of intelligent behavior in plants will be presented later in another section.

(11) Autonomic system (sympathetic and parasympathetic) i.e., heart and respiratory regulation, vasoconstriction and dilation, gastrointestinal and genitourinary stimulation or relaxation, etc.

(C) Instinctual behavior with increasing degrees of complexity, from bacteria seeking nourishment all the way up to man's learning to walk. Most all plant and animal behavior falls into this category (i.e., plant roots seeking moisture, fight-or-flight reflexes, birds flying, etc.)

(D) Learning ability.

(E) Reasoning.

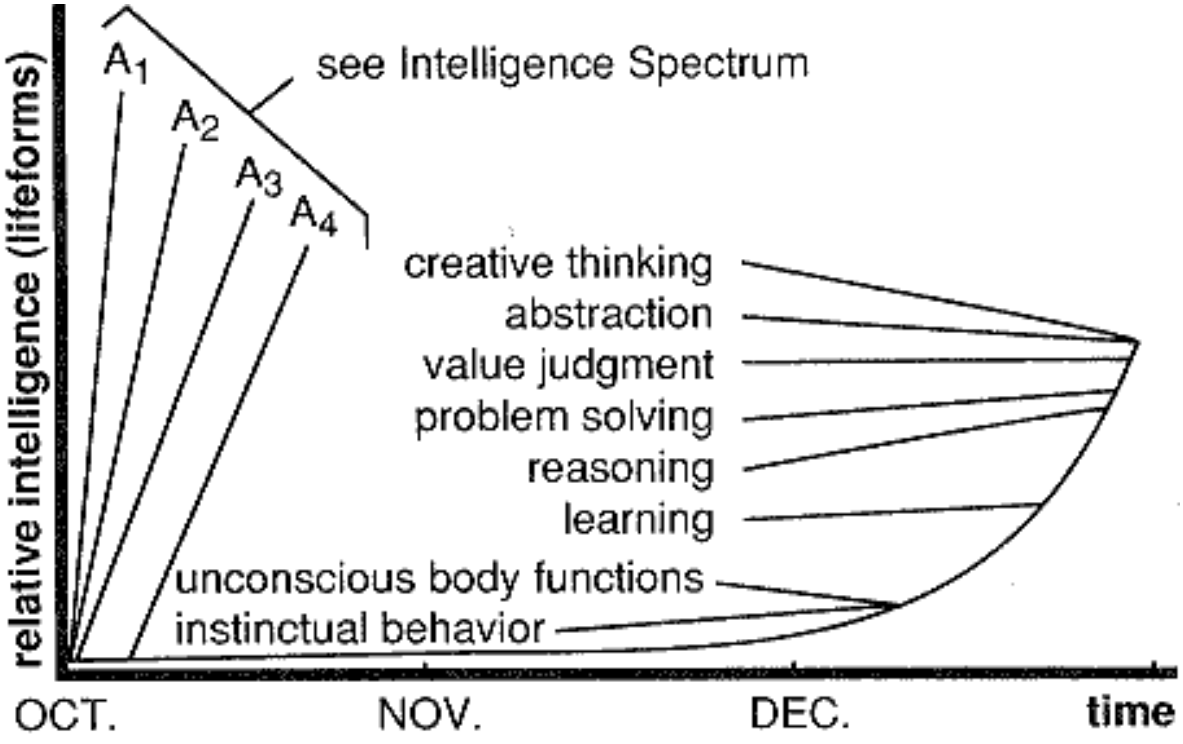
(F) Problem solving.

(G) Value judgment.

(H) Abstraction.

(I) Creative thinking.

The appearance of these increasing states of intelligence can be placed on a non-linear time curve as was done in the prior section, but in this case substituting the various categories of intelligence for the estimated arrival times of categories of organisms. As before, each point on the curve can only be approximated, and thus the slope of the curve is in question.



This spectrum of intelligence exists as such because of the very way in which it has come about through a gradual process of upward evolution. It was relatively simple in the earliest life forms and has become very complex with the arrival of man.

What I have envisioned as a spectrum or continuum has been referred to by others as a principle of hierarchization. This implies that there are successive levels of increasing complexity, flexibility and coordination in form, function and behavior, ranging from the relatively simple to the relatively complex. This is the same basic concept as presented in General Systems Theory in Chapter Three. Hierarchization is found all around us, and is most apparent in terms of coordinating functions; i.e., the nucleus coordinates the activities of a single cell; nerve ganglia coordinate information passing through radiating synapses; the brain stem of higher mammals coordinates many bodily functions; and a queen bee coordinates the activities of the hive. (Ref. 7.1)

Each cell of any organism contains a total program in memory which potentially could allow it to construct the entire organism; however, each cell soon specializes during embryological development, giving up its toto-potentiality. It does this through a sophisticated electrochemical communications system. The individual cells collaborate to form a higher system which becomes greater than the sum of its parts. (Ref. 7.2)

At the less complex levels of the hierarchy, each unit develops and maintains its own integrity while participating in the generation of a higher level of function or behavior. The lower levels of hierarchy forfeit some of their autonomy to the next higher level which then has the responsibility of coordinating the activities of the lower level. (Ref. 7.3)

A vast inorganic hierarchy also is apparent and is comprised of structures of increasing complexity, including quarks, electrons, atoms and molecules, each generating the next higher order and each coordinating the activities of the lower. These inorganic molecules somewhere along the way apparently transmuted into organic ones, which then led to the formation of macromolecules, organelles, cells, tissues, organs, organ systems and higher life forms. Each of us inhabits a body that is hierarchically constructed. (Ref. 7.4)

The upward evolution of hierarchy seems to have been instituted from the top down, rather than from the bottom up, requiring a more complex source of information guiding the drive upward to higher and higher states of complexity. (Ref. 7.5)

A great deal of scientific research is being compiled which illustrates how intelligence permeates all levels of complexity within life forms, and has led to the synthesis of General Systems Theory as well as the principle of hierarchization. An immense amount of communication is continuously taking place within all living organisms on a molecular level. The ability to communicate in any form implies the presence of intelligence. Presented below are examples of communication that occur between the central nervous system (CNS), the immune system, endocrine system and autonomic nervous system, all of which is accomplished via neuropeptide molecules. The limbic system within the CNS also has been found to generate feelings, which are transmitted by the same neuropeptide messenger molecules.

The elaborate connection between the CNS and the immune system has been studied by many and is gradually becoming increasingly understood.

Candace Pert has acknowledged the link between the nervous and immune systems. It has been found that the immune system is engaged

in communications and a form of cognition. Neuropeptides originating in the CNS appear to direct the movement of components of the immune system such as the monocytes, which are directly involved in tissue repair. Monocytes manufacture collagen, recognize and eliminate foreign bodies and communicate with B- and T-cells within the immune system. It has also been found that the monocytes which are manufactured in bone marrow can become glial cells in the brain. So far, well over fifty neuropeptides have been discovered that act as communicating molecules between the CNS and the immune system in a bi-directional information network. (Ref. 7.6)

The immune system also is beginning to appear to be a liquid sensory-motor organ under control of the CNS. It seems to be influenced by both positive and negative emotions. Positive feelings tend to facilitate the actions of the immune system and negative feelings suppress it. Norepinephrine is released during the experiencing of negative emotions and has been shown to suppress immune function. Men whose wives are dying of cancer have decreased levels of lymphocytes, which are those cells critical to the immune system's ability to fight off disease. Both nerve cells and lymphocytes have been found to possess identical receptor sites for certain chemicals, thus providing a communications link between the CNS and immune system. (Ref. 7.7)

Animal experiments have also demonstrated the relationship between the brain and the immune system. Gerard Renoux of the University of Tours in France found that destroying part of the mouse's cerebral cortex changed the structure and ability of immune cells, i.e., the number of white blood cells in the spleen would drop and the ones remaining would become less efficient at killing tumors and responding to foreign cells. (Ref. 7.8)

The immune system exhibits memory, which is considered to be one of the properties of intelligence. This memory is stored in the unconscious

and represents a kind of biological learning which yields, as needed, specific antibodies to fight infection, repelling selectively and for a lifetime the invasion of any alien matter. (Ref. 7.9)

Communication manifesting intelligence has also been found to exist between the CNS and the endocrine system, utilizing the same neuropeptide messengers. Ernest Rossi, a psychologist, has proposed a mind-gene connection based on communicating messenger molecules. He believes circumstances and emotions shape our behavior and health through brain-body influences down to the cellular level.

Just as information from the CNS directs the immune system, it also controls various other body systems, including the endocrine, via hormones and other neuropeptide messenger molecules. The endocrine system, for example, is under the control of the unconscious mind, which operates through the limbic system. Proto-hormones in the hypothalamus are released and these in turn liberate hormones in the pituitary. These various hormones then can activate the different endocrine organs such as the adrenals, thyroid, ovaries and testes. The target endocrine organs respond by producing steroid-type hormones which can penetrate individual cell walls throughout the body. They can traverse the cellular cytoplasm and enter the nucleus where they unzipper specific parts of the genes. The DNA templates manufacture RNA, which communicates information to the cellular cytoplasm as to which proteins are to be manufactured. (Ref. 7.10) Thus the unconscious mind oversees all bodily functions in similar fashion, demonstrating how intelligence controls this hierarchy of systems.

The same neuropeptides that are activated by the CNS and exercise control over the immune and endocrine systems also influence the autonomic nervous system. This system, which is ordinarily under control of the unconscious, can also be influenced by the conscious mind. For example, patients with chronic hypertension have been able to

learn how to control their blood pressure through biofeedback techniques. (Ref. 7.11) Exotic techniques have also been used in yoga for many years allowing them to learn how to clot their own blood at will, as well as reverse peristalsis in their gastrointestinal tract to nourish themselves with fluids sucked up through their anus. They have also learned how to slow their rate of metabolism to survive for hours in airtight containers on a fraction of the oxygen thought necessary to sustain life. (Ref. 7.12)

It is becoming increasingly obvious that the autonomic nervous system, as well as all other body systems, are under direct control of the unconscious mind as part of the intelligence system. It is also apparent that the conscious mind can at times be trained to take over direction of many processes and body functions that ordinarily are under control of the unconscious.

The limbic brain, which oversees the endocrine system, has also been shown to be intimately involved with the release of neuropeptide messenger molecules that generate our feelings and emotional responses. Paul MacLean, chief of the National Institute of Mental Health's laboratory of brain evolution and behavior, believes that the limbic system is our emotional brain and thus generates feelings in response to the environment which are both protective and aggrandizing, including the emotions of desire, anger, fear, sorrow, joy and affection. (Ref. 7.13) These feelings and all others are transmitted by various neuropeptide molecules which are the same neuropeptides that direct the movement of components of the immune, endocrine and autonomic nervous systems. The latter two systems plus the limbic system have all been shown to be involved in the expression of emotion, probably because the neuropeptides released by the limbic system affect the other organ systems simultaneously. (Ref. 7.14)

Many animals have limbic brains, so that it is not reaching too far to suggest that perhaps they have much of this same capacity. Many animals certainly do display evidence of emotion. It would also seem reasonable to presume that human emotion had to undergo the same evolutionary process that other systems went through.

The phenomenon of consciousness needs to be included in the intelligence spectrum; however, there is certainly no lack of controversy as to how this should be done. Do only humans experience consciousness? Should primates be included? Or does consciousness extend farther down the evolutionary scale? There are proponents who would restrict the existence of consciousness to human experience, and there are others who would argue that all lifeforms have varying degrees of it. There are some who see consciousness as a basic property of matter and would maintain that it stretches all the way back through phylogenetic evolution and beyond. (Ref. 7.15) Others assert that consciousness is not inherent in all matter but is actually a fundamental property of all living tissue. (Ref. 7.16) Darwin would be included in this group. Still others link the beginning of consciousness to the appearance of associative memory and learning. (Ref. 7.17) Once an animal is able to modify its behavior on the basis of its experience, it must be having an experience; therefore it must be conscious. (Ref. 7.18) Julian Jaynes would even place the origin of consciousness in man as late as the second millennium B.C. (Ref. 7.19)

Hoimar v. Ditfurth has stated that unquestionably there are innumerable degrees of mind. This is apparent, both through evolutionary history and at the present time, in the experiential grids of so many species, each at a different level of development. These grids can be arranged in a finely gradated series so that they appear as a seamless continuity. Mind did not suddenly burst into the world, but evolved in a steady, slow, tortuous process. He believes that as matter evolved mind went through a process of increasingly more elaborate development. (Ref. 7.20)

The concept of consciousness is an enormously complex subject and will be dealt with in a later section. Consciousness requires the existence of intelligence but the presence of intelligence does not necessarily require the existence of consciousness.

Self-consciousness in animals has been studied experimentally, and according to Gordon Gallup chimpanzees have been found to exhibit it. They can come to recognize themselves in mirrors, as well as recognize themselves as themselves. (Ref. 7.21)

Whether consciousness is confined to higher animals or is inherent in all matter, non-living included, it probably follows a non-linear curve much like that for intelligence.

The concept that intelligence is manifested across a wide spectrum throughout the entire animal and plant kingdoms will be further illustrated in a later section. However, it should already be very apparent that intelligence operates at all levels of living tissue as reflected by molecular memory and extensive neuro-chemical communication.

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Chapter 8

Genetic vs. Environmental Influences Affecting Evolving Intelligence

(6) The gene is the basic unit that contains the ultimate blueprint for the great variety of ways in which intelligence manifests itself in all lifeforms; however, the environment is a potent modifier and plays a large role in determining the ultimate level of intelligence that any organism eventually achieves. Intelligence has become programmed into the genetic code of each organism. All living tissue contains genes made up of DNA molecules that hold the master plan for each of our potential types and levels of intelligence. Genes created us mind and body. A given gene as an underlying basic component of the intelligence system will have many different effects on different parts of the body of any organism. (Ref. 8.1) All given parts of the body will be influenced by many genes. The effect of any one gene depends upon its interaction with many others. (Ref. 8.2)

In combination, the genes program all organisms, man included, with their inherent, inborn potential intelligence. Our genes contain the coded instructions for building our brains. As animal and plant life evolved, the genes did their best (in advance) to preprogram each organism with rules and advice to cope with as many eventualities as they could anticipate. Only those genes that successfully anticipated problems correctly ended up surviving. (Ref. 8.3) This resulted in the upward evolution of intelligence through natural selection.

Every cell of any organism carries all the genetic information for constructing every part of the organism's body, including the upper and lower limits of its intelligence. Most of this information is apparently

suppressed when a cell becomes specialized into a blood cell, nerve or muscle cell. (Ref. 8.4) Only a tiny fraction of the information stored in the DNA of plant and animal cells is necessary for constructing the organism. The rest is composed of superfluous sequences repeated hundreds if not thousands of times over again. (Ref. 8.5) The suppression of the superfluous sequences is apparently accomplished by regulatory genes. (Ref. 8.6) It is possible that rapid changes resulting in new species (punctuated equilibria) could be the result of an abrupt alteration within a regulatory gene, which in turn calls for a novel reorganization of preexisting patterns. (Ref. 8.7) A single regulatory gene either switches on or off whole sequences of structural genes. (Ref. 8.8) If this theory is correct then it may be possible for many individuals of a new species to be produced simultaneously. (Ref. 8.9)

Each individual's intelligence can be modified significantly by environmental factors such as diet, educational stimulation, etc., but most geneticists believe that these acquired characteristics will not be genetically passed on to the next generation. Rupert Sheldrake has challenged this concept since he believes that there is now a large body of evidence which indicates that acquired characteristics can be passed on from one generation to the next. Sheldrake cites experiments conducted on fruit flies that he concludes adequately demonstrate this phenomenon. (Ref. 8.10) He maintains that our present understanding of genetic inheritance, which restricts this process to genes, cannot explain the inheritance of acquired characteristics. This requires some other type of mechanism as could occur with his proposed morphogenetic fields.

Molecular biologists have been unsuccessful so far in explaining the development of embryos or the inheritance of instincts in mechanistic terms. Genes and the synthesis of specific proteins are involved but much is still left unexplained and is still mysterious. (Ref. 8.11) Sheldrake believes that heredity would best be explained on the basis of both genes and morphic resonance, with the genes acting as a receiver rather than a

source or transmitter of information. The Integrated Theory of Intelligence would be quite compatible with either a straight genetic inheritance or morphic resonance; however, does favor the operation of both.

Howard Gardner is convinced that there is considerable plasticity and flexibility in human growth but that it is modulated by strong genetic constraints. (Ref. 8.12) He believes that to a large extent everything that we will ever achieve has been coded in our genetic material. (Ref. 8.13) This is not to say that each of us does not have a wide potential range for achievement, with some surpassing others. The expression of intelligence in any one individual can vary substantially within rather broad limits. Scientists vary in their beliefs as to what percentage of intelligence is inherited as opposed to that which is conditioned by environmental factors. Some would place the heritability of intelligence, as measured by IQ tests, as high as 80%, and at the other extreme there are those who would estimate it to be as low as 20% or even 0. Most estimates run between 30 and 50%. (Ref. 8.14)

There would seem to be little question that each individual is born with a genetically predisposed potential range of intelligence. It is a well-documented fact that there are certain hereditary diseases which can be passed from one generation to the next and that result in mental retardation. (Ref. 8.15) One such example would be the Fragile-X syndrome. This is a genetic form of mental retardation secondary to an X-chromosomal defect, and it stresses the role that inheritance plays in determining one's intelligence range level. The other interesting facet of this disorder is that much of the intelligence deficiency can be reversed by treating the patient with high doses of folic acid. In one patient treated with this substance, the IQ jumped from 60 to 105. (Ref. 8.16) This represents evidence that intelligence operates at the molecular or atomic level.

It would also appear that there are certain individuals who are born with a latent potential for high intelligence which may or may not ever be actualized. (Ref. 8.17) The great majority of us would appear to be destined to be neither retarded nor genius.

Our human genetic structure reflects countless imprints of the physical environment encountered by all of our previous ancestors dating back to the beginning of life forms. This has helped shape the evolutionary pathway of our species. Thus our bodies and their intelligence represent living fossils that embody a coded history of our planet. (Ref. 8.18)

The brain structure is built to specification as directed by genetic DNA; however, the relatively unstimulated, inexperienced newborn brain is a soft lump of overly wired, overly connected tissue requiring a lifetime of fine-tuning to bring it to full potential. At birth there are two or three times as many nerve cells as in the adult. Many cells cease to function when not used. Our brains appear to be overly endowed with the potential to respond to almost any eventuality. Through the adaptive process we are called upon to respond to certain challenges which establish distinctive circuit patterns within the brain. The environment that each organism is born to will determine what those selective challenges are. Our brains are molded and fine-tuned by our experiences. Many nerve connections appear to fail because of disuse, and then vanish. Other connections remain in place but cease to function. Our early experience provides the foundation upon which subsequent knowledge and skills will build.

Intelligence in any individual is not static but is constantly changing, being subject to a continual interplay between external forces and internal processes. One's functioning level of intelligence varies substantially over time and can be influenced by a wide variety of environmental factors. Even though genetic inheritance places upper and lower limits on each of our intelligence ranges, the environment

determines just where each of us falls within that range. A newborn infant has the rudimentary capacity for perceiving and acting, and appears to be able to experience pain and pleasure, but it is incapable of displaying those characteristics that we ordinary attribute to mind. It has no conscious memory, imagination or the ability to solve problems or display true thinking. (Ref. 8.19) If raised in an impoverished environment, such as children abandoned in the wild, it will fail to develop any of the higher mental functions. (Ref. 8.20) A 13-year-old girl named Genie was discovered after having been locked away all her life by her parents. She was mute, incontinent, crawled on all fours, understood nothing that was said to her, and demonstrated no evidence of mind. After four years of foster care she developed to the level of an eight-year-old, manifesting some language ability and many social skills. (Ref. 8.21)

Mind therefore is a product of the culture and society within which we are raised. (Ref. 8.22) Language also appears to play a role in the development of consciousness and mind. It is conceivable that teaching language to chimpanzees not only increases their ability to communicate with humans, but actually may raise their level of consciousness. (Ref. 8.23)

Experiments with rats comparing groups raised in an enriched environment versus groups raised in an impoverished environment demonstrated an increase in size of the brain cortex for those raised in an enriched environment. The enriched environment was comprised of communal cages with running wheels and various toys, in addition to which the rats were frequently handled and petted by caretakers. (Ref. 8.24)

William Greenough, at the University of Illinois, performed a similar experiment and demonstrated that rats raised in an enriched environment had more dendritic branches and therefore presumably more synapses between neurons. Additionally, he found evidence that new synapses form in 10 to 15 seconds or less. (Ref. 8.25)

There is also experimental evidence in monkeys that specialty training physically alters cerebral cortical geography. As we develop new skills we continuously remodel our brains by what we put into them. (Ref. 8.26)

Steven Rose, a British neuroscientist, also believes that our brains are changed by the way we use them. He believes that our brain size may not be so different from that of early man but that our brain state, including the connectivity of cells, is different. Our changing environment and forms of society have produced changes in intelligence and consciousness. (Ref. 8.27)

There is additional evidence that brain size and cell count do not tell the whole story as relates to intelligence. Early man, dating back to approximately 100,000 B.C., had a brain size comparable to our own, but it wasn't until 15,000 B.C. that he began painting on cave walls, 5,000 B.C. that cities began forming, and 4,000 B.C. that he devised a form of writing. Man's larger brain size appeared to endow him with a potential that we are only now beginning to more fully realize. (Ref. 8.28)

It should also be pointed out that brains of idiots are sometimes physically larger than those of great intellects and some geniuses have comparatively small brains. (Ref. 8.29) This again stresses the importance of how the evolution of intelligence has as much to do with the rearrangement of synaptic connections as with the physical increase in brain size.

Anthropologist Sherwood L. Washburn has stated that the evidence indicates it was after humans began making tools that the real explosion in brain size occurred. Their tools, used in a great variety of ways, helped to stimulate a more rapid growth of the forebrain. (Ref. 8.30)

A large brain provides only the potential for high intelligence. Any brain not properly stimulated will not develop.

There are many environmental factors which are continuously competing and that alter one's level of manifested effective intelligence. This level is unquestionably in a constant state of flux. We are ordinarily not aware of any change occurring since most of the time the difference is too small or happens too slowly to perceive. It would also seem likely that what we are aware of at any one moment in time is our level of consciousness or awareness and not our level of intelligence per se. Unless an individual is in an altered state of consciousness, it would seem that the experience of ordinary consciousness is quite stable over time no matter what one's fluctuating level of intelligence is.

There is much evidence that human physical and mental processes vary greatly based on daily and other temporal cycles. Chromopsychology has emerged as a new field to study cyclic effects on body and mind. There are biological rhythms ranging from 90 minutes to annual cycles that affect physical, emotional, and cognitive aspects of human behavior, and undoubtedly affect other animal behavior as well. Many activities have a "best" or most likely time of day. There is a substantial fluctuation of hormones, minerals and other chemicals in the blood throughout a 24-hour period that is cyclic. Circadian cycles also appear to influence mood, blood pressure, pulse rate, body temperature, cell division, immune response, learning ability and other cognitive processes. Shielding individuals from electromagnetic fields or changing their geographical location will alter their circadian rhythm. (Ref. 8.31)

It has been clearly demonstrated in research studies how various drugs can enhance or diminish memory. High altitude can also significantly influence learning and memory. Studies performed on climbers who were high enough to experience some oxygen deprivation showed they experienced hyperventilation, hormonal changes, and impairment of

verbal learning and short-term memory. These deficits did return to normal in time. (Ref. 8.32)

It would appear that stress can reduce effective intelligence, according to research done by Bernard Brown of the Department of Health and Human Services in Washington, D.C. A group of white middle-class children had an average drop in IQ score from 105 to 91 and had diminished capacity for complex tasks and complex thinking after being subjected to stress. (Ref. 8.33)

An individual's intelligence can vary up to 40 IQ points as a result of different environmental influences. There is actually a rather large body of evidence which suggests that our brains have the capacity for continued growth throughout our entire life and that each of us has the ability to become increasingly intelligent. Evidence indicates that the greater the amount of information an individual learns, the greater the capacity for further learning. (Ref. 8.34) Each of us would appear to have the capacity to actively increase our own effective intelligence by manipulating our own environment. Good diet and nutrition probably play a part. It is becoming apparent that certain chemical agents such as choline and lethecin may enhance memory. Both are natural precursors to acetylcholine which is one of the neurotransmitters acting at the level of the synapse within the brain.

Howard Gardner believes that both motivation and attention are extremely pivotal in the training of intelligence. (Ref. 8.35) Meditation and other techniques would appear to stimulate creativity and help to achieve higher-order concepts relative to our reality.

It has been established by neurologists that in certain altered states of consciousness, such as deep meditation or intense creativity, both

hemispheres shift into a single, coherent rhythm, operating in unison referred to as synchrony. It has been possible over the past many centuries to achieve this state through meditation; however, very recently certain brain-stimulation devices have been developed which it has been claimed can rapidly elevate the brain of virtually anyone into this beneficial state. Such things as euphoria, reverie, recollection of long-past experiences, stimulation of memory, sexual excitement, deep concentration, and heightened creativity have been reported by altering the electrochemical activity of the brain with a multitude of mechanical devices. (Ref. 8.36) Experimental studies suggest that various mind machines can dramatically improve IQ, neuro-efficiency quotient, long-term memory, serial memory, attention, reaction time, recall, sensory acuity, hemispheric synchronization, and brainwave amplitude, as well as other capacities. (Ref. 8.37) One of several devices invented is the sensory-deprivation flotation tank developed by Dr. John Lilly, which allows one to float in body- temperature water in total darkness and silence, making it possible to achieve various states of altered consciousness. (Ref. 8.38)

Although I have had no experience with any of these devices, it would seem theoretically possible to achieve the results claimed. Much research needs yet to be done to determine their effectiveness.

If one's intelligence can be enhanced through individual effort, it might also follow that any skill might be improved. The performance of any skill is dependent upon certain criteria which might be expressed mathematically:

Performance $\propto$ (Conc.)(Motiv.)(Time)(S&K Int.)

Concentration = Level of focused consciousness

Motivation = Level of intensity of desire to achieve objective.

Time = Total time previously devoted to skill acquisition.

Spatial and Kinesthetic Intelligence = Coordinated integrated motor skills required by artists, musicians and athletes as defined by Jack Fincher. (Ref 8.39)

Multiple examples have been given as to how one's effective intelligence level varies as the result of environmental influences. This would appear to be the result of the manipulation of matter, and again demonstrates the interconnectedness of matter-energy and mind (or intelligence). Since an organism's intelligence potential is preprogrammed into its genes (DNA molecules) this implies that intelligence acts on a molecular or atomic level. The DNA molecule, which is now known to be comprised of four basic nucleotide building blocks in varying order, ultimately determines the complexity of our brain by directing the spatial arrangement of its molecular structure. The human brain has an extremely elaborate, complicated, complex distribution of billions and billions of molecules arranged intricately in such a way as to allow the manifestation of our current intelligence. It is this complicated spatial arrangement of matter which governs the level and nature of our intelligence.

This would also imply that atomic events happening at great distances can have effects upon our brain by causing minute changes in the spatial distribution of our brain's molecular structure. (Ref. 8.40) Our minds and bodies therefore would partially be subject to virtually all cosmic events as discussed under property No. 1.

It might be said in summary that an organism's upper and lower limits of potential intelligence are under genetic and possibly morphogenetic field control, but that environmental factors also play a very significant role

in determining the ultimate level that is actually achieved. Intelligence has passed an apparent threshold which now allows us to consciously seek ways of furthering its continued upward evolution. Even now it would appear well within our grasp to determine new ways to achieve this. Each of us, if motivated strongly enough, has it within our power to increase not only our effective intelligence but also to achieve higher states of consciousness. This will be discussed in more detail in a later section.

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Chapter 9

Evidence for the Existence of Intelligence within Animals and Plants

(7) Intelligence permeates and governs the motion and direction of all living tissue (plant and animal) and is also manifested at the cellular level. Chomsky states that natural selection, acting on chance mutations, is not sufficient to explain the elaborate creations of nature, and cannot by itself account for what happens in evolution. (Ref. 9.1) Pierre-Paul Grasse, France's leading zoologist, says Darwinism cannot account for the most striking and obvious aspect of evolution, namely its inventiveness. (Ref. 9.2) This requires the presence of intelligence, which helps direct the evolutionary process.

As suggested before, intelligence has a direct mathematical relationship to the process of entropy. It has had to become very creative in finding new ways to overcome entropy. The process of entropy utilizes all of the recognized physical laws to bring about the destruction of any and all complex material forms, and the operation of intelligence is competing against this natural process. Entropy could be considered as anti-intelligence. The two opposing processes are very natural and very much interdependent because without the entropic process intelligence would not have evolved to the state that we now recognize. Through natural selection intelligence has evolved in opposition to entropy, which has shaped and molded it. The instinct for survival is a basic property of intelligence, which is programmed into all life forms beginning at the molecular level, and operates in direct opposition to the entropic process. Life-forming molecules which are capable of reproducing themselves have this basic "instinct for survival" property which competes against the basic destructive property of entropy. In life forms

the instinct for survival has been edging out the destructive process of entropy and an upward evolutionary process has resulted. This has also resulted in less evolutionary pressure toward the development of organisms that respond to individual atomic events, but more toward the development of receptors that measure properties of distributions like temperature and atmospheric pressure. (Ref. 9.3)

Prigogine, who won the Nobel prize for chemistry in 1977, suggests that organized systems arise naturally out of unorganized matter. He proposes the existence of a principle which pushes living organisms, including human beings themselves, to states of greater and greater complexity. (Ref. 9.4) States of greater complexity are associated with higher levels of intelligence. The "instinct for survival" may represent a component of the principle he proposes.

Intelligence permeates the entire plant and animal world, no matter how simple or complex the organism. It is most easily recognizable in primates. Most of science has rejected any recognition of creative intelligence or consciousness within animals, probably out of blindness, or even arrogance, which humankind has always been so well endowed with. A new attitude is beginning to surface within the scientific world which is starting to reverse this opinion. We are beginning to realize that many animals do have a rather sophisticated intelligence that allows them to communicate with other members of their own species. A few, such as higher primates and possibly porpoises, can even be taught to communicate with man. Chimpanzees have the ability to learn and use human sign language and even to invent new expressions with them. This begins to give us evidence that animals do indeed have intelligence as well as consciousness. The latter is probably less than the self-awareness that humans experience, but I am convinced that it undoubtedly exists.

There can be no serious doubt that intelligence represents a spectrum with little separation between different species when arranged in an order of ascending complexity. Even humankind, which traditionally has been viewed as high above the rest, comes closer than one might imagine to being a near relative of higher primates. And even today some primitive human cultures are not so far removed intellectually from the level of certain primates. The homo sapiens of 50,000 years ago must surely have been even more like the other primates of that era.

A great deal of research performed on primates over the past two decades has forced us to reappraise our relationship to them. Higher primates are extraordinarily intelligent creatures.

Primates as well as many other animals are frequently challenged with new situations definitely not in their experience-behavior repertoire, situations which demand unique responses and the synthesis of new behaviors. (Ref. 9.5) It is becoming increasingly apparent following close observation of chimps that they display many behavioral patterns similar to humans, including discovery of tool usages, learning of artificial languages, observance of incest taboos, and invention of new behaviors. (Ref. 9.6)

Not only do certain animals, particularly primates, display many behaviors similar to those of humans, but if one compares their genetic structure one finds only minor differences. The chimpanzee has a DNA molecular structure which is 99% the same as that of humans.

Molecular biologists have also developed a new technique, referred to as the DNA clock, which is a way of measuring genetic distances and dating evolutionary branching points. The conclusions reached support the concept that the higher primates, and particularly the chimpanzee, are very close relatives to humankind. (Ref. 9.7) This closeness has also

been observed by Judith Hooper and Dick Teresi, who believe that non-human primates have a "mental landscape resembling our own." They "are capable of elementary logic, jokes, banter, deliberate misinformation, cajoling, deep sorrow, rich communication." (Ref. 9.8)

As indicated before, chimpanzees appear to be our closest relative. They display many behaviors which are similar to those seen in humans. In addition to those intelligent behaviors already mentioned, there are many more which might be listed.

Chimpanzees have learned to converse in sign language as well as to use a computer typewriter to do all the primary things with their specialized iconic speech that a young child does with theirs. (Ref. 9.9) Beatrice and Robert Gardner have been teaching American sign language to chimpanzees with more than modest success. Some chimps have vocabularies of up to 200 words which they can use to communicate intelligently in simple, easily understood sentences. They can communicate with humans as well as with each other. They have even been inventive with their new language by combining two symbols to make complex words, as in using the signs for "water" and "bird" to produce "duck." (Ref. 9.10) The chimps have steadily broadened their intelligent world. They have demonstrated the ability to absorb, generalize, combine and invent an extensive system of names for objects in their environment. (Ref. 9.11) They can use their words to distinguish agents, actions and concepts. One chimp that had learned to understand spoken English words for several objects quickly learned the sign language equivalence without the objects being anywhere in sight. This represents an impressive cross-modal transfer. They can understand, construct and modify formal language semantically. (Ref. 9.12)

Some primates can translate visual into tactile images, a procedure referred to as cross-modal perception. Koehler has found that chimpanzees shown objects they could see but not touch were able to

select matching objects from an unseen mixture of articles in a bag. (Ref. 9.13)

Primates are capable of reorganizing mental processes, and evolve new operations of mind when challenged by their environment. Their interaction with humans has demonstrated how chimpanzees are capable of abstracting information, modifying and translating language, transferring concepts and then teaching this new material to others of their own species. (Ref. 9.14)

In addition to demonstrating a proficiency with language, chimps have also been observed using crude tools. One example of tool usage was observed by Jane Goodall. She found that they would use wild strip sticks to probe termite holes and then eat the insects collected. This is evidence that they also comprehend the relationship of means and end. (Ref. 9.15)

Also, chimpanzees found in Gombe National Park in Tanzania have been observed to ritually treat themselves with aspilia leaves, which contain a potent antibiotic. Every few days the chimps travel to a specified area where the aspilia plant grows. They pick the leaves, suck on them for a few moments and then swallow them whole. Females treat themselves every ten days and males every thirty days. The antibiotic kills common bacteria. African peoples also have used the same plants medicinally to treat wounds and stomachaches. There are four species of the plant. It is very interesting that the African humans use three of them, and so do the chimps. (Ref. 9.16)

According to Robert Augros and George Stanciu in their book The New Biology, "Animals are clearly conscious agents, but is consciousness the same as intelligence? Animals undeniably act on the basis of sense perception, emotion, and instinct, but do they reason or deliberate? Do

they possess intellectual understanding? Certain observations and experiments seem to point to affirmative answers to these questions, especially with regard to primates." (Ref. 9.17)

Karl Pribram has worked with chimpanzees at Stanford's Center for Advanced Studies and has tested for both intelligence and consciousness. The latter has been tested for by painting an animal's forehead and then placing them in front of a mirror. If the animal attempts to rub the paint off, this then is considered to represent evidence that they possess self-awareness. The major apes, including gorillas, chimpanzees and orangutans, all try and rub the paint off. (Ref. 9.18)

Primates other than chimpanzees also display highly intelligent behavior. There is much evidence suggesting that the origins of personal intelligence can be found in species other than our own. In monkeys, for instance, there is normally an attachment link between mother and infant similar to that seen in psychologically healthy humans. Harry Harlow's research pertaining to motherless monkeys has determined the presence of a similar psychopathological state like that seen in humans under similar circumstances. A monkey raised without a mother develops abnormal affective behavior. They are not able to react appropriately to other monkeys and cannot assume their proper role in the dominance hierarchies. Motherless monkeys will cower in fear or aggressively attack other monkeys in inappropriate situations. They also prove incapable of raising their own offspring. (Ref. 9.19) A female motherless monkey does not make a good mother, which indicates that motherhood is not completely instinctual.

Ronald Myers and his colleagues at the National Institute of Health have found that they can produce abnormal social reactions in monkeys by certain types of surgical intervention. For instance, by removing the prefrontal cortex in juvenile primates they produced a decrease in the

use of facial and vocal communication, an alteration in aggressiveness and patterns of grooming, a decreased participation in play activity, as well as frequent sessions of hyperactivity of an aimless variety. (Ref. 9.20)

The hundredth-monkey phenomenon, as described by Lyall Watson in his book Lifetide, is also very revealing relative to intelligence in animals, although he has since indicated that he regards it as at least partly metaphorical. He tells of a tribe of monkeys on an island close to Japan to which was introduced a new food, freshly dug dirt-covered sweet potatoes. The monkeys were reluctant to eat them because they were dirty, and it wasn't until an 18-month-old female monkey named Imo solved the problem by taking the potatoes to a nearby stream and washing them that progress was made. Imo taught this new behavior to her mother and other younger monkeys, who also in turn taught their mothers. The mature adults did not adopt the behavior unless directly taught by their children. Then rather suddenly it became a universal phenomenon, as if a threshold was passed that required a critical mass. Not only were all the monkeys on the one island suddenly washing and eating potatoes, but this behavior seemed to jump natural barriers to other islands, as well as to the mainland of Japan so that other tribes of monkeys were copying this behavior. This represents an abstraction of thought and cultural breakthrough. Even more importantly, it suggests that there may be other yet-to-be-recognized forces operational in the process of evolution. (Ref. 9.21)

These same Macaque monkeys that have traditionally loathed water now have learned to enjoy it. They first discovered that the salt from washing potatoes in sea water improved the potatoes' taste. They later found that scattered food grains could be salvaged by putting them in water and collecting them as they float, allowing dirt and sand to separate from them by sinking. These two discoveries produced profound cultural changes since the use of water led to swimming. The younger monkeys also found the water to be a delightful playground. (Ref. 9.22)

There is also experimental evidence that monkeys are capable of abstract thinking. According to Griffin, monkeys were able to consistently select from among three objects that single item which was unlike the other two. He concluded that this seemed to indicate they were able to grasp the abstract concept of dissimilarity. (Ref. 9.23)

Other primates have also been studied extensively, including baboons, and have been found to display highly intelligent behavior. For example, baboons send watchers to the outskirts of their colonies as a way of providing protection for the group. If a watcher senses danger he will make a barking sound, resulting in the scattering of the colony. If the animal giving the alarm is a young one, the troop adults may check out the source of alarm before running away on the word of an inexperienced youngster, thus giving evidence of the baboon's ability to discriminate and to use logic and reason. Primates do seem to have rudimentary forms of many human attributes. (Ref. 9.24)

There is much evidence being accumulated which would suggest that many non-primate animals also are capable of thought and decision-making. A gazelle, for example, might sense an approaching lion. It reacts by lifting its head, indicating that its attention has been aroused. At this point it has a choice of at least three alternatives. It may casually lope away to a safer place, it may break into a desperate run, or it may judge the danger to be non-existent or minimal and resume grazing. The gazelle appraises the nearness of the danger and its magnitude, and displays an appreciation of the mathematical product of the time-space factors of how imminent the danger is, based on its own time-space potential. It judges how fast and how soon and what distance the danger will travel to reach it, as well as how fast and how soon and what distance it will have to cover to escape the danger. (Ref. 9.25)

The observation of this action would imply that a thought process has occurred. This, of course, does not necessarily indicate that there is consciousness involved, since one could still argue that this behavioral process is an unconscious action. Nevertheless, if a similar behavior were witnessed in a human it would be believed a conscious act. It is most difficult to determine the presence or absence of consciousness in other animals; perhaps, however, our denial of animal consciousness is more of the same self-centered perception of existence that led to previous erroneous beliefs, such as the earth or sun being the center of the universe. The inability of science to prove the existence of consciousness in animals is most probably the shortcoming of humankind and not of the animals. (Ref. 9.26)

Donald Griffin, a biologist who has written a book entitled Animal Thinking, is convinced that animals display conscious awareness. He sees some animals as capable of planning, making choices, adapting to new situations, cooperating, counting and ratiocinating. (Ref. 9.27)

It has also been demonstrated that animals are able to select which among many incoming stimuli will be registered in consciousness. This we all experience frequently, such as when we effectively "tune out" distracting sounds by concentrating our attention on one voice among many in a crowded, noisy room. (Ref. 9.28) A similar phenomenon can be demonstrated in a cat by monitoring brain activity with an implanted electrode and watching for changes in brainwave patterns as awareness shifts. If a cat sits calmly with a metronome ticking in the background, a brainwave pattern is produced with a higher amplitude wave presenting each time a tick is heard. When the cat sees a mouse its attention shifts, tuning out the irrelevant ticking of the metronome, and resulting in a substantial change of the electrical activity recorded on a graph. (Ref. 9.29)

There is evidence that higher animal forms may dream. EEG recordings in sleeping birds and other mammals show very similar patterns of REM

sleep. Donald Griffin has written: "Sleeping dogs sometimes move and vocalize in ways that suggest they are dreaming; their movements resemble those of feeding, running, biting and even copulation. They sometimes snarl or bark." (Ref. 9.30)

Many animals display evidence of goal-oriented behavior. For example, some birds, such as the plover, will feign injury to distract a predator and lead it away from its nest of young. By behaving as if it had a broken wing, it can entice a predator several hundred yards away from the nest, and then suddenly fly away and return to its home by an indirect route. (Ref. 9.31)

Many other non-primate animals, such as dolphins, display remarkable intelligence. Dolphins have been found to have a vocabulary of at least 32 distinct sounds, including whistles, clicks, barks, squeals and groans. Scientists working with them claim to have begun communication with them via a computer-generated whistle language. Each distinctive whistle represents a word or phrase and can be strung together with others to form basic sentences. Four and five-whistle combinations can be understood by them. (Ref. 9.32)

In many animals the evolution of sense organs has advanced to higher degrees of function relative to humans. For instance, many animals see deeper into both ends of the light spectrum (ultraviolet and infrared) than do humans. A dog's nose is one million times more sensitive than man's at detecting certain odors. Birds utilize the earth's magnetic field in guiding their flight paths. Certain animals including hawks and eagles have more acute eyesight than man. Prawns can detect depth to within one centimeter. Both bats and dolphins utilize echolocation. Certain moths can smell each other up to a mile away. (Ref. 9.33) Mankind in general has favored vision and intelligence at the expense of the other attributes.

As we travel farther down the evolutionary scale, the presence of intelligence becomes less obvious; however, it is nevertheless unquestionably present. Anyone who argues otherwise is presented with the problem of defining where the threshold lies, above which there is intelligence and below which there is not. There are basic attributes of intelligence that can be demonstrated in less complex life forms, including the presence of memory, the ability to communicate with other members of the same species, and the capacity to make choices between two or more alternatives.

It is becoming increasingly apparent that the basic attributes of all nervous systems can be found in the activities of a few invertebrate neurons. Many simple animals can learn and remember things similarly to humans, but with far less equipment. (Ref. 9.34) Memory has been proved not to be a uniquely human attribute. All recurring events have an effect on any nervous system that records them and reacts to them. (Ref. 9.35)

Richard Leakey has stated, "The quality that accompanies the emergence of learning in the evolution of higher animals, namely intelligence, is surprisingly difficult to define. Basically, any animal that can modify its behavior by making use of information it receives from its environment may be thought of as intelligent." (Ref. 9.36)

Learning has been defined as a lasting adaptive change in behavior as a result of experience or practice. Learning of several kinds has been observed in various insects, and it ranges from the simplest type, habituation, to those types involving more complex learning behavior patterns. (Ref. 9.37) Habituation refers to the gradual decrease in response to a stimulus following repeated exposure. As an example, an insect that is exposed to a high-intensity light may eventually "tune out" the light. This reflects a loss of sensitivity to recurrent environmental stimuli that are unimportant to the survival of the individual organism. (Ref. 9.38)

A higher level of learning is one referred to as associative learning, and can also be seen in insects. They commonly display the ability to make learned associations between stimuli that normally produce no response, and reinforced actions, i.e., actions leading to reward or punishment. Bees, for instance, can associate colors with food sources and learn to seek that color rather than following the original olfactory cues. Bumblebees can learn the shapes of nectar-bearing plants and seek them out selectively on that basis. (Ref. 9.39)

An even higher level of learning is termed latent or exploratory learning. Bees and wasps can learn to locate their nests through memorizing and recognizing landmarks. In the first excursion from the nest or colony, foraging females or workers identify a series of landmarks that serve as cues or memory aids in locating the homesite during the return trip. (Ref. 9.40)

The honeybee is quite complex, with a nervous system possessing approximately 7,000 neurons. With its small brain it can perform an amazing array of feats. It can carry out a complex array of acts in the hive including comb-making, feeding, cleaning, repairing and sealing. It can smell; estimate the sun's angle to within 2 to 3 degrees; detect color; know the time of day within 30 minutes of the actual time; steer a course by monitoring sky illumination, landmarks and smells en route; estimate distance traveled; measure frequency of dance movements of other bees to learn the distance and location of a food supply; as well as multiple other tasks. (Ref. 9.41)

The ability of any organism to communicate would imply the presence of intelligence. Communication is highly developed in social insects, and can occur in a variety of ways. Chemical communication is widely developed, particularly in the eusocial insects, and includes the release of certain chemicals, and tasting. Auditory communication is also well

developed and includes stridulation, tapping and many other types of signals. These various communication systems elicit behavior patterns that include alarm, attraction and assembly, food recruitment, grooming and trophallaxis. (Ref. 9.42)

An earthworm contains nerve cells distributed throughout its entire body. If its primitive brain is removed it can still feed and burrow, though more slowly, as well as enter into coitus, and learn a way through a maze. (Ref. 9.43)

Ascaris, an intestinal parasitic worm, is a very simple lifeform relative to man, possessing only 162 brain cells, yet it can learn, does possess a memory, and can act on information received. (Ref. 9.44)

Substantial experimentation with planarian worms has produced additional insight into the intelligence of lower lifeforms. This particular organism is thought to have a very ancient existence from which many higher forms of invertebrates and also certain of the vertebrates presumably evolved. It was determined that these organisms could be trained in simple ways, and manifested memories. (Ref. 9.45)

Protozoa, which are single-celled organisms, display lower levels of intelligence. Those which possess cilia can retreat from unpleasantness, advance upon food, and dodge obstructions even though they do not possess a nervous system. (Ref. 9.46)

A single-celled, trumpet-shaped aquatic animal, the stenter, ordinarily lives with the mouthpiece of its trumpet anchored to a water plant or other stable object. If the stenter is disturbed by some external stimulus such as a jet of water, the organism will twist or bend on its anchor to avoid the jet. If this disturbance is repeated a number of times, the organism will detach its grip and seek a new location. (Ref. 9.47)

Decades ago, the zoologist Oswald Kroh found that the unicellular amoeba displayed "determinacy of behavior on the basis of individual conditions," an impression of spontaneity, and ability to orient itself to various environmental stimuli. Kroh attributed "genuine mental accomplishments" to the amoeba, while yet indicating that it was still "a long way from any sort of consciousness." (Ref. 9.48)

Although many informed scientists have long been able to accept the inherent intelligence manifested throughout the animal world, it has only been more recently acknowledged that a parallel intelligence is present in the plant kingdom. It is considerably more primitive, but nevertheless exists.

Any organism which is capable of communication with another organism is displaying evidence of intelligence. Plants appear to be able to communicate in ways yet to be understood by humankind. A Romanian scientist, Eugene Celan, found that when he added a toxic agent to the water of one plant, another control plant in a separate container manifested parallel reactions, such as a synchronous change in temperature. And it would appear that infection or chemical injury to a plant can also be communicated to a physically isolated cell. (Ref. 9.49)

Many of the same molecules which are necessary for the operation of intelligence within animal forms are also found within plant life. For example, various neurotransmitters found in human and other animal brains, such as acetylcholine, serotonin, epinephrine, and norepinephrine, have been found to be involved in various plant responses. (Ref. 9.50)

Plants in general display many types of behavior that reflect the presence of intelligence, a few of which are listed below. The Venus

flytrap is a carnivorous plant that will suddenly close its petals and trap an insect. It will hold onto it and digest it, deriving nutrients from it. (Ref. 9.51) Many plants fold or lower their leaves at night or during cloudy weather, then reopen or raise them when light returns, as a protection or as a mechanism of energy and water conservation. (Ref. 9.52) Even very simple plants such as the flagellate alga Euglena are phototatic. They will move up and down in the mud where they live, taking advantage of daylight and photosynthesis, and retreat downward at night. (Ref. 9.53)

Plant roots below ground are partially stimulated in the direction they travel by available water. They are capable of seeking moisture and growing in its direction. Plant roots will also alter their course of direction to avoid obstacles. (Ref. 9.54) Even Darwin, over a century ago, said that plants acquire and display the power of movement only when it is of some advantage to them. He stated, "It is hardly an exaggeration to say that the tip of the radical (the root) thus endowed, and having the power of directing the movements of the adjoining parts, acts like the brain of one of the lower animals." (Ref. 9.55)

Some plants have tendrils that make wide sweeping movements in order to find supporting structures upon which they can start twining. The Cyclanthera pedata has tendrils which will begin to curve around a support within 20 seconds of initial contact and make their first complete coil around the support in four minutes. (Ref. 9.56) The Mimosa pudica will move one of its leaflets if lightly touched, and with increasing disturbance will fold all of the feathers within each of its leaflets seemingly as a protective response. (Ref. 9.57) The Silver linden and wood sorrel group their leaves in bright sunlight in order to avoid scorching. Grass leaves open and close to avoid excessive transpiration in arid conditions. (Ref. 9.58)

Plants have been described as having a "primitive neuroid system." Some plants have been detected to have electrical potentials, with

visually reported pulses that greatly resemble those of vertebrate peripheral nerves. (Ref. 9.59)

One of the ways that intelligence manifests itself is by endowing all organisms with the freedom of choosing among two or more alternatives. This freedom of choice is very limited in unicellular organisms and plants, but broadens tremendously as one climbs the evolutionary scale. Nevertheless, choice-making is a fundamental property of all life forms. (Ref. 9.60)

According to J.Z. Young, the process of living involves the utilization of whatever information is available to make choices between alternatives, with the ultimate goal of achieving the continuation of life. Every organism contains DNA which has programmed instructions that influence whatever choices an organism makes. Every cell within every organism must continuously make choices, from moment to moment, relating to those operations that are required to meet each new challenging situation. (Ref. 9.61) The DNA is continuously giving instructions to each individual cell, concerning how to select the appropriate chemical action to meet each eventuality that is likely to cause the cell to disintegrate. (Ref. 9.62)

Life continues because each cell, as well as each organism, makes repeated choices among previously established sets of possible alternative actions. (Ref. 9.63) All living things do act in a directed way under the influence of a controlling mechanism. Cellular as well as organismic behavior is regulated by the record stored in their DNA, which has accumulated over an extremely long period of time. Prior selections made throughout this long past continue to influence every organism during its entire life span. (Ref. 9.64) More complex organisms are faced with many more choices.

All behavior in higher animals, including man, will be strongly influenced by DNA programming; however, higher up the evolutionary ladder there can be little doubt that the presence of consciousness must be introduced into the equation pertaining to the decision-making process. Behavior becomes increasingly less predictable as the lifeform becomes more complex. Human conscious choosing is a special development that has slowly evolved through a long tortuous process. When a person makes choices it involves selection from a very large set of possible actions. When a bacterium makes choices there are a very limited number of possible actions to choose between. (Ref. 9.65) The types of choices open to a bacterium center primarily around what enzyme systems it will employ to continue its metabolic processes. It has many alternative pathways to choose from depending upon what nutrients are available in its immediate environment. Flagellated bacteria such as Vibrio cholerae have a tail which allows them to be more mobile than others. They have a choice as to where they propel themselves. (Ref. 9.66) The choices of a bacterium are not unlimited, and they have been predetermined by natural selection.

All life involves selection between alternative possibilities. Evolution has enabled plants and animals a wide range of possible choices, thereby increasing their chance of survival in an ever-widening range of habitats.

As organisms become more complicated they come to need a larger and larger variety of possible actions to help avoid destruction. All living things must make choices. No two living organisms are exactly and identically the same chemically, and because of this it is impossible to predict the behavior of any single organism. (Ref. 9.67)

All life forms demonstrate astonishing unity, including the capacity to build their own parts, increasing differentiation through time, the power of self-repair and self-regeneration, the ability to transform other

materials into self, and natural action from within. [Ref. 9.68] All of these are manifestations of intelligence.

Our bodies contain in excess of one hundred thousand billion (1014) cells which are working cooperatively with each other. [Ref. 9.69] These cells collectively contain 1029 elementary particles. [Ref. 9.70] Each cell contains a nucleus, inside of which the DNA-containing genes carry encoded information. This stored information is under the control of the intelligence system, which is responsible for directing all cellular behavior. Within the cellular membranes surrounding the nucleus there is a gelatinous substance, cytoplasm, that contains a variety of other structures collectively referred to as organelles. These correspond in function to organs contained in higher life forms. One such organelle would be mitochondria, of which there are many. They act as the "lungs" by picking up oxygen entering the cell and then using it to release energy. Cellular respiration can be thought of as a precursor of pulmonary respiration. Ribosomes, which form another class of organelles, build proteins much like the liver. They pick up amino acids that enter the cell and, following their genetically coded instructions, manufacture whatever proteins are required to accomplish cellular metabolism. Waste is handled by other organelles, the lysozomes, and excreted from the cell. [Ref. 9.71]

It was discussed in an earlier chapter how the immune system displays evidence of intelligence at the cellular level. This is a further example of how intelligence governs the action and direction of all living tissue.

Immunologist Nick Hall has indicated that he believes there is a resemblance between immunological and behavioral memory. The brain stores information pertaining to our everyday experiences. In similar fashion lymphocytes can "remember" encounters with various microorganisms, so that if they are encountered again the body can mount a stronger attack. Hall also draws a parallel between behavioral

and immunological memory, since both reach their peak during puberty and fade simultaneously during older age. As conscious memory fades, the immune system's capacity to remember its own tissues and previous invading infections also falters, which accounts for an increased incidence of auto-immune diseases and tumors. (Ref. 9.72)

The amount of information contained within any living cell, particularly one from a higher mammal, is awesome. Only a very small fraction of the coded information within a DNA molecule is ever expressed. The external form of a living structure (phenotype) can be as simple as a white blood cell yet embody, as coded information (genotype), all of the complex history and potential of almost everything that has ever existed within a given species. (Ref. 9.73)

The evidence presented above, which represents examples of intelligence operating within all animal and plant forms, is not meant to be exhaustive. It should, however, illustrate the concept of how intelligence permeates all life, and should also provide additional insight as to how it represents a spectrum or continuum of all life forms.

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Chapter 10

Evidence for the Existence of Intelligence within Non-Living Matter

(8) There is evidence for the existence of intelligence operating within non-living matter. This is much more difficult to discern than when viewing living systems, and I believe it cannot be scientifically validated at the present time. Nevertheless, our inability to prove the existence of intelligence or consciousness in non-living matter does not exclude the possibility of its presence there. Many well-informed, scientifically oriented individuals believe that consciousness is an attribute of inorganic matter. For example, David Bohm has been trying to derive a consistent quantum-relativistic theory of matter. He begins with the concept of "unbroken wholeness" and sees non-local connections as an essential part of this wholeness. He has found it necessary to regard consciousness as an integral part of his theory. (Ref. 10.1)

As indicated in the last chapter, there can no longer be significant doubt that intelligence is a continuum that permeates all living tissue. Is there a threshold between living and non-living matter so that intelligence is operational in only living tissue, or does the continuum bridge across this apparent gap to involve inorganic matter also? As will be discussed, the distinction between living and non-living matter is not nearly as discrete as originally perceived.

Gary Zukav has written that "the distinction between organic and inorganic is a conceptual prejudice." The distinction becomes harder to maintain at the level of quantum mechanics. (Ref. 10.2)

As stated previously, quantum theory suggests that the universe is not simply a collection of physical objects, but is rather a complicated web of relations between the various parts of the unified whole. "Quantum interconnectedness" is continually being observed in the study of quantum theory. Non-local connections have been found when observing seemingly local events. There appear to be instantaneous connections to the universe as a whole. The Einstein-Podolsky-Rosen (EPR) experiment illustrates the non-local connections and supports the concept of instantaneous transfer of information over great distances without any expenditure or transfer of energy. The spin of one electron can "instantaneously" affect the spin of another electron over a great distance. (Ref. 10.3) "It has been estimated that the microscopic state of a gas in a laboratory would be altered significantly in a fraction of a second if a single gram of matter as far away as Sirius, the dog star, were to be moved a distance of only one centimeter." (Ref. 10.4) These non-local connections with instantaneous communication occur in both organic and inorganic molecules. Subatomic particles within all types of molecules appear to instantaneously know what decisions are made elsewhere. (Ref. 10.5)

As discussed in Chapter Four, Shannon has shown that the accumulation of information in any system, non-living or otherwise, is a reciprocal process to that of entropy and is mathematically related by the simple conservation law.

$$\mathbf{H + I = constant = H_{max} = I_{max}}$$

The "Theory of Information" basically implied that nature must be interpreted as matter, energy and information. Information was seen as an agent that informs the material world much as the messages of the genes instruct the machinery of the cell to build an organism. Information was also seen as a universal principle at work in the world,

giving shape to the shapeless. It is found in all organic and inorganic systems at all levels of existence. Entropy was seen as a measure of the disorder of a physical system. (Ref. 10.6) As suggested earlier, information is not synonymous with intelligence, though they are similar in concept.

According to Layzer, the universe is not running down. It is continually gaining in information. The thermodynamic arrow of time opposes this process and points toward increasing entropy, because large scale information decays into smaller scale information, which in turn is dissipated by the effects of random disturbance from the outside; but the cosmic expansion, moving away from the uniform disorder of the primal explosion toward a more highly ordered physical universe, continually results in the creation of new macroscopic information. There will always be more information in the universe than there used to be. (Ref. 10.7) Again, this concept applies to both organic and inorganic matter without distinction.

The distinction between living and non-living matter is difficult to discern. Viruses are particles which have attributes of both living cells and non-living molecules. They are completely dependent upon another living host for replication. Larger viruses (200 micrometers) contain protein, polysaccharide, and lipid in biologically reasonable proportions compared to bacteria, while the smaller ones (10 micrometers) appear to be pure nucleoprotein. The smallest viruses contain only a few hundred atoms. Viruses have no independent metabolism, like other unicellular organisms, and thus parasitize the metabolic mechanism of the host cell. They only act alive when inside a living cell. The bacterial viruses appear to consist of little more than genic material (DNA) which, on entry into the host cell, seizes and dominates its normal directive mechanisms so as to force the synthesis of new virus substance. Therefore, although viruses do reproduce, they cannot do so independently of another organism. (Ref. 10.8) They are truly intermediary between living and non-living structures.

Prions are a biological anomaly which contain protein and reproduce in living cells; however, they do not appear to contain any DNA or RNA. Prions are infectious agents which appear to be involved in Alzheimer's disease. They likewise represent intermediate forms between the usual life and non-lifeforms. (Ref. 10.9)

Proteinoid microspheres have been produced in laboratory experiments where conditions of a primordial earth have been simulated. These microspheres represent dense clusters of amino acids coagulated together as organic material floating in mostly inorganic fluid. In many ways they resemble bacteria. They appear to possess a semi permeable membrane similar to a cell wall, through which smaller molecules such as calcium and potassium can pass, but not larger ones. Some discharge of waste occurs; however, there is a net intake of material during what is regarded to represent a primitive metabolism. When subjected to turbulence, analogous to early oceanic wave motion, the larger microspheres break into smaller ones, which has been interpreted by some to represent a primitive form of replication. Some of the divided microspheres grow again in size only to be ruptured by another act of replication. These are non-life forms which are behaving very much like simple, true life forms. (Ref. 10.10) In addition to the lifelike properties already described, it was found that stimulating the microspheres with light resulted in rhythmic patterns of electrical impulses indistinguishable from those found in natural, excitable brain cells. (Ref. 10.11)

Sidney Fox and Aleksander Przbylski claim that these microsphere properties that they have shown to be present, including rudimentary metabolism, reproduction, self-organization, electrical activity and exchange of ions, meet the minimum requirements for signs of life. (Ref. 10.12) This further blurs the distinction between life and non-life forms.

Physicists Richard Brewer and Erwin Hahn claim to have demonstrated the presence of memory at the atomic level. They state that "atomic memory" is apparent when atomic systems that have moved from order into chaos are induced to recover their pre-existent order. They have demonstrated how a system of particles that has decayed from a highly ordered state can be returned to that state by reversing the motion of its particles. (Ref. 10.13)

Artificial intelligence, as we see in computer systems, is becoming increasingly complex. These non-living structures yet further blur the distinction between intelligence existing in living and non-living matter. Artificial intelligence might be viewed as an extension of natural intelligence.

Intelligence would appear to influence the motion and direction of all matter, whether living or non-living. The motion and direction of inorganic matter as contained within our earth, for example, is under the influence of its own intelligence system. It acts automatically or unconsciously just as do our own bodily functions. For instance, we are not aware of our immune system manufacturing antibodies or our bone marrow producing blood cells.

A larger physical body in the right environment, such as the earth, will find itself evolving in the direction of increasing complexity just as does the animal and plant life it contains. It definitely contains much more of Shannon's "information" in its present physical system than it did in its primordial state. The earth is undergoing entropy as are all other physical systems, but it has also become much more complex during the passage of time. Entropy, rather than destroying our local physical system (earth), has aided its upward evolution into a state of increasing complexity. Entropy is not the enemy that it has traditionally been viewed, but is rather a necessary integral function of the cosmic web, aiding the continual process of increasing complexity of both physical

and living bodies. Entropy has produced a universal background of physical change which then has allowed all matter to enter into more complex arrangements of literally an infinite variety. Those states that "make sense" or "work the best" in a particular physical system are selected out. Our earth has an ocean covering three-fourths of its surface area, and has mountains, deserts and an atmosphere of various gasses, because the entropic process continually changed the structure of matter, thus allowing those certain physical systems to be selected out which worked best under the constraints of physical laws.

Intelligence as a force in opposition to the entropic process has resulted in the earth becoming more complex and richer in information. Intelligence appears to manifest a self-generating complexity as one of its basic properties. It has an inherent instinctual need to evolve in an upward direction. This inherent property produces a positive pressure that leads toward increasing complexity. Only those physical systems that could survive the rigorous physical laws, which the Newtons and Einsteins of the world have helped discover, are presently in existence here or elsewhere within the universe.

The physical earth appears to have its own intelligence system that is capable of self-correcting behavior, as suggested in James Lovelock's Gaia hypothesis. Lovelock has compiled a great deal of evidence which would tend to indicate that the entire biosphere of earth, including its atmosphere, the oceans, and the soil, forms a self-regulating system that maintains those conditions within which life can flourish. (Ref. 10.14)

Large physical systems such as the earth are basically constructed out of non-living matter; however, so is all living tissue. Our planet's surface is coated with a multitude of living organisms, including a great deal of plant life. One might argue that plants exist more as part of an extension of the earth's crust rather than as separate individual entities, somewhat similar to the way that the outer layer of cells forms skin tissue on living

organisms. Plant life not only acts as a food source for most living organisms, but also restores oxygen to the atmosphere as part of earth's self-regulating mechanism.

All organisms which are presently in existence or have ever existed on earth are part of its intelligence system. By admitting that all of us are part of a larger local intelligence entity does not take away from our own individual importance or that of any other organism. Each of our bodies originated from the atoms and molecules comprising the earth's crust and they will eventually return to it, yet intelligence on earth will continue to evolve just as it always has.

As the universe continues to expand, many other physical systems (stars and planets) that presently manifest less variation and complexity than our earth will undergo a similar evolutionary process of becoming increasingly complex in information. The nature of the physical object and its proximity to other objects will in part determine its destiny based upon physical law. Nevertheless, all physical systems with sufficient energy will become more complex through an evolutionary process.

Not all large physical bodies are destined to maintain life as our earth is doing, but some will and indeed already must be doing so; and those living, evolving forms will have a great variety of different presentations, just as those of our own earth have had.

The spectrum or continuum of intelligence thus appears to extend even beyond the limitations for life forms as stated in a previous section. It ultimately seems to contribute to the destiny of all non-living matter as well. The question need not be asked as to whether intelligence made or invented the laws which allowed its evolution, since those laws are an inherent part of the universe just as is intelligence.

Even though the presence of intelligence in non-living matter has yet to be proven, the Integrated Theory of Intelligence predicts that it governs all inorganic material substance as a continuum.

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Chapter 11

Continued Non-Linear Evolution of Intelligence

(9) There will continue to be a further upward evolution of intelligence at a non-linear exponential rate. There is no clear reason for us to think that humankind is the end product of the evolutionary process. There are reasons to suspect that evolution of intelligence is continuing at the present time, although even non-linear evolution would be hard to perceive in just a few thousand years of recorded history. As time continues to pass, perhaps the upward evolution of intelligence will be easier to recognize, because as a non-linear process it will continue to increase.

There are those behavioral scientists who would present arguments that because man himself has intervened into his own life process through cultural evolution, the selective pressures now favor the less intelligent individual, and because of this the average intelligence of man is now declining. George Gaylord Simpson has argued that if more intelligent parents have more children, then the population will become more intelligent and that the opposite will occur if less intelligent parents have more children. He would then maintain that it is possible, if not probable, that on average each new generation nowadays is mostly derived from the less intelligent members of the last generation. Because of this he believes that mankind as a whole, or at least a considerable segment, may be evolving in the direction of less intelligence. (Ref. 11.1) Although his logic would seem to have merit, there are many reasons why this does not appear to be in fact happening. Even if he is right for the moment, the evolutionary increase of intelligence, as it has occurred to the present time, need not necessarily have been an unbroken straight line of upward mobility. It may well have had its peaks and valleys.

The Integrated Theory of Intelligence would advance the hypothesis that there will continue to be an upward evolution of intelligence in spite of these other selective pressures.

It would be a very self-centered assumption on our part to conclude that man in his present form, particularly with regard to intelligence, is the final product of evolution. We have continually fallen into the same trap throughout our recorded history, believing in essence that the universe revolved around us in our present state of near-perfection.

It has been recognized by a substantial number of scientists in various fields that the evolution of increasingly complex organisms has occurred non-linearly. The evolution of life forms began extremely slowly according to paleontologists. Prokaryotes, which are the simplest single-celled organisms in existence, have been dated back about three billion years, and for at least the next two billion years were the only life forms in existence. The first evidence of eukaryotic cells dates to about 600 million years ago, which represents the beginning of the Cambrian period. (Ref. 11.2) The appearance of eukaryocytes led to the beginning of an evolutionary explosion which has been accelerating forward ever since. Most of the major phyla of the invertebrate animals came into being over the next few million years. (Ref. 11.3) This was eventually followed by the appearance of vertebrates.

Barbara Brown in her book Supermind makes reference to the relatively rapid evolution of complex animal life as compared to the slow rate of evolution of simpler animal forms. (Ref. 11.4) Higher animals have experienced a dramatic increase in brain size over the past several millions of years. The horse, for example, Eohippus, had a brain volume of 25 cc 50 million years ago. It is considerably larger in the present-day horse. (Ref. 11.5)

There has been a rapid increase in primate brain size over the past six million years, again demonstrating a non-linear accelerated growth rate. Australopithecus africanus, dating back to six million years ago, had an endocranial (E.C.) volume of 430 to 600 cc The E.C. volume increased to 500 to 800 cc in Homo habilis by 3.7 million B.C., to 750 to 1250 cc in Homo erectus by 1.5 million B.C., and to 1100 to 2200 cc in Homo sapiens by 200,000 B.C. (Ref. 11.6)

About nine billion brain cells were added during those years, which averages approximately 150,000 per generation. (Ref. 11.7)

Judith Hooper and Dick Teresi make reference to the exponential increase in the number of neural cells and their interconnections in animals with near-infinite bits, and near-infinite choices in their brains. (Ref. 11.8) Hooper and Teresi seem to be intuitively recognizing this non-linear process. Richard E. Leaky also makes reference to "the apparent acceleration of human evolution over the past four million years, and particularly the last one million....". (Ref. 11.9)

Richard M. Restak in his book The Brain makes the following statement: "The exponential growth of the human brain during the last 250,000 years is unique in the history of evolution. Even today we lack a satisfactory explanation how it came about." (Ref. 11.10) He recognizes an explosive growth of the human brain that he intuitively sees as being non-linear.

Even though the evolution of intelligence has unquestionably been occurring at an accelerated non-linear rate since life began, it has yet to be determined whether this rate is exponential, quadratic, cubic or based on some other logarithmic function. One way to judge the rate of the evolutionary process is to estimate the minimum information content

contained in an organism's genetic material. For example, a typical DNA molecule in a human is composed of approximately five billion pairs of nucleotides. Since the information content of any message can be calculated in terms of bits (binary digits) and since there are four different kinds of nucleotides, the number of bits of information in human DNA can be calculated by multiplying four times five billion nucleotide pairs. This calculates to be 20 billion bits. In similar fashion, the number of bits of information can likewise be calculated for other more simple organisms as well.

The number of bits of genetic information can then be plotted onto a graph against the estimated time of origin of each organism. A similar graph can be constructed by plotting an approximate estimate of the amount of information contained within the brains and nervous systems of the same organisms. Both curves are definitely non-linear, reflecting a continuously accelerating rate of increasing information content [(Ref. 11.11)] (See Figure 2 in Chapter Six). The graph curves could be exponential, cubic or of some other log function. Neither curve is precise enough to indicate with certainty the exact rate of the evolution of information. However, if one argues that information content is directly proportional to level of intelligence, there can be no question that intelligence has evolved at a continuously accelerating rate.

The evolution of human intelligence during the past three to four million years can be seen to reflect an increasingly sophisticated use of tools, [(Ref. 11.12)] beginning with simple rocks and other natural devices, and culminating non-linearly in the use of computers and robots. This process has likely been facilitated through a feedback mechanism. Anthropologist Sherwood L. Washburn believes that it wasn't only better brains that improved tools, but that using tools made better brains. He has stated that the evidence indicates that it was after humans started making tools and weapons that the real explosion in brain size occurred.

The use of better tools in a wider variety of ways helped to promote a more rapid growth of the forebrain. (Ref. 11.13)

Other occurrences also enhanced the rate of evolution of human intelligence. The freeing of hands by upright walking and the development of language contributed significantly. Richard Leakey has stated, "This behavioral complex, once initiated, fed back on itself, pushing evolution faster and faster, eventually to produce the human species." (Ref. 11.14) He believes that the development of language is probably the latest step, and probably the most significant one, in the evolution of the human brain. (Ref. 11.15) The use of productive oral-auditory language likely began the major explosion in human evolution about 35,000-40,000 years ago at the time of Cro-Magnon man. It is about that time that clear signs of human symbolic capacities, including pictures, emerged. (Ref. 11.16)

According to Leakey, the invention of agriculture about 10,000 years ago also played a very important role in the process of human evolution. He has stated that, "The invention of agriculture was without exaggeration the most significant event in the history of mankind." (Ref. 11.17) Food supplies could now be concentrated into small areas allowing the formation of villages, towns and eventually cities. (Ref. 11.18) Farming societies allowed for population growth. This in turn allowed the more exceptional individuals--who were most likely to make new discoveries, perfect new skills and innovate the old--to perform these functions. (Ref. 11.19) Each new invention further acts to divide those individuals who can master its use from those who cannot. This tends to select reproductively in favor of those who can. (Ref. 11.20)

In the past several million years the strongest selection pressure in man has been for behavioral traits of increasing intellectual complexity, including comparing, analyzing, separating, and grasping relationships, as well as classifying, counting, abstracting, conceptualizing, recalling,

imagining and planning. (Ref. 11.21) Ethologist Konrad Lorenz points out that these mental manipulations must come from environmental demands acting directly upon the large range of behaviors made possible by the increasingly complex nervous functions of our developing cerebrum. (Ref. 11.22)

Jonas Salk, one of the discoverers of the polio vaccine, has stated that humankind has moved into a new epoch where evolution favors "the survival of the wisest." (Ref. 11.23)

As the human brain evolved, it gradually developed the attribute of foresight and the ability to use logic. As soon as there were men and women in the species who knew how to pick up a stone in advance, this gave them an obvious advantage over those who didn't. Those who can think or plan ahead have the obvious survival advantage. They can keep themselves alive when others are starving. (Ref. 11.24) It is the same mechanism of natural selection which has always been operational throughout all of existence. This mechanism unquestionably favors intelligence when all else is equal.

Some of the pressures which are present that would tend to select out the more intelligent individuals are wars, famines, and other natural disasters. It seems reasonable to conclude that a more intelligent person might find creative or adaptive ways to survive a famine, while those of lesser intelligence would be at greater risk. During wartime, a more intelligent person would have a better chance of finding an effective way of avoiding death. He would at least have the competitive edge. Even in our society today, the military is concerned that the level of intelligence in the typical average enlistee is below normal. If so, during battle this would result in an increased death rate of less intelligent individuals. It would seem that the more intelligent a person is, the greater the chance of avoiding an accident during wartime or peace. Whether any or all of these arguments are valid is probably irrelevant to the extent that until

now there has been a continual upward evolution of intelligence, and any reversal is likely to be temporary. There are any number of pressures that humankind will continue to face in the future, and which will be likely to continue the upward trend or increase of intelligence guided by natural selection.

It would seem as if intelligence has found a way to purposefully increase itself in an evolutionary upward direction. One of the major hypotheses of this theory is the concept that the evolution of intelligence continues, and will continue perhaps without limit, at least to the same degree that the universe is limitless. Intelligence has continued to evolve until now, and there are reasons which will be cited that might effectively argue that this evolutionary process will continue at a non-linear accelerated rate. If so, the implications are spectacular if not awesome. For example, several important questions can be asked, including:

1) Where will humankind be in one hundred years, one thousand years or ten thousand years?

(2) As intelligence increases, does social consciousness increase as well?

(3) Will humankind achieve higher states of consciousness as time passes? Will the ordinary state of consciousness, in a more evolved species, approach or become what we now can only occasionally experience in an altered state or "peak experience"?

Barbara Brown also sees the need for a purposeful "separate organizing mechanism" that is operating beyond chance. She believes that if the

genes that determine which animal life survives are merely the result of chance, then it would seem that the more complex animal lifeforms would take proportionately longer to evolve rather than the reverse. (Ref. 11.25) Brown states that precisely because animal life does evolve in as orderly a manner as it does, and because the evolutionary process is accelerated in the evolution of complex forms, therefore a force or operational principle has likewise simultaneously evolved to influence the orderliness in which life is expressed. (Ref. 11.26)

Evidence points to neural tissue as the vehicle that both communicates all survival needs and acts as the intermediary mechanism that produces whatever changes are required by the organism for adapting and surviving. Neural tissue could act as the medium of evolution, and provide the means for an organizing influence or force, to cause an accelerated evolution of complex lifeforms in the face of an overabundance of genetic changes that have no survival value. (Ref. 11.27) Brown also maintains that as neural tissue became organized into brain by a self-modifying action, the product of neural activity or the information that it transmits became progressively more important in the self-regulation of the nervous system. In other words, the product of the activity of the nervous system influences its own activity by way of a feedback mechanism. (Ref. 11.28)

Each human lifespan is so minuscule when compared to the length of time required for humankind to evolve that we have great difficulty in trying to discern any relative change in intelligence even during the entire recorded history of humankind. Six thousand years is an extremely short time interval when compared to 3.5 billion years of other evolving life forms. Nevertheless, there is now a significant amount of evidence accumulating which suggests that the upward

evolution of intelligence is continuing. One example would be the apparent rise in overall IQ as measured by a multitude of different types of standardized tests.

Raymond Cattell, in attempting to prove that IQ scores were dropping, tested 10-year-old children in Leicester, England, in 1936 and again in 1949. To his surprise he found that there was an increase. The U.S. Army's alpha test demonstrated an average increase in scores, comparing inductees of 1914 to those of 1940. S. Smith compared IQ scores of Honolulu children in 1924 to those of 1938 and discovered a 10-point increase in verbal IQ and a 20-point increase in nonverbal IQ. (Ref. 11.29)

James R. Flynn compared Dutch army draftees of 1952 to those of 1982 and found a 20-point IQ increase. He also collected data from investigators around the world studying IQ in such countries as the U.S., Japan, France, Belgium, Norway, New Zealand and Canada, as well as six other developed nations. He found that in a single generation there were IQ gains ranging from 5 to 25 points. In the Netherlands in 1982, about one-quarter of the population had IQs of at least 130, which places them in the mentally gifted category. There was also a 60-fold jump of IQs over 150. One thing is certain: if there is any overall increase in intelligence, it could not occur from genetic changes. Flynn believes that learned strategies of problem-solving likely played a role. (Ref. 11.30)

Evolving intelligence is not restricted to humankind. Even in animals there is evidence of a continued evolution of intelligence, as manifested by their ability to develop more complex forms of behavior. The hundredth-monkey phenomenon discussed in another section is an

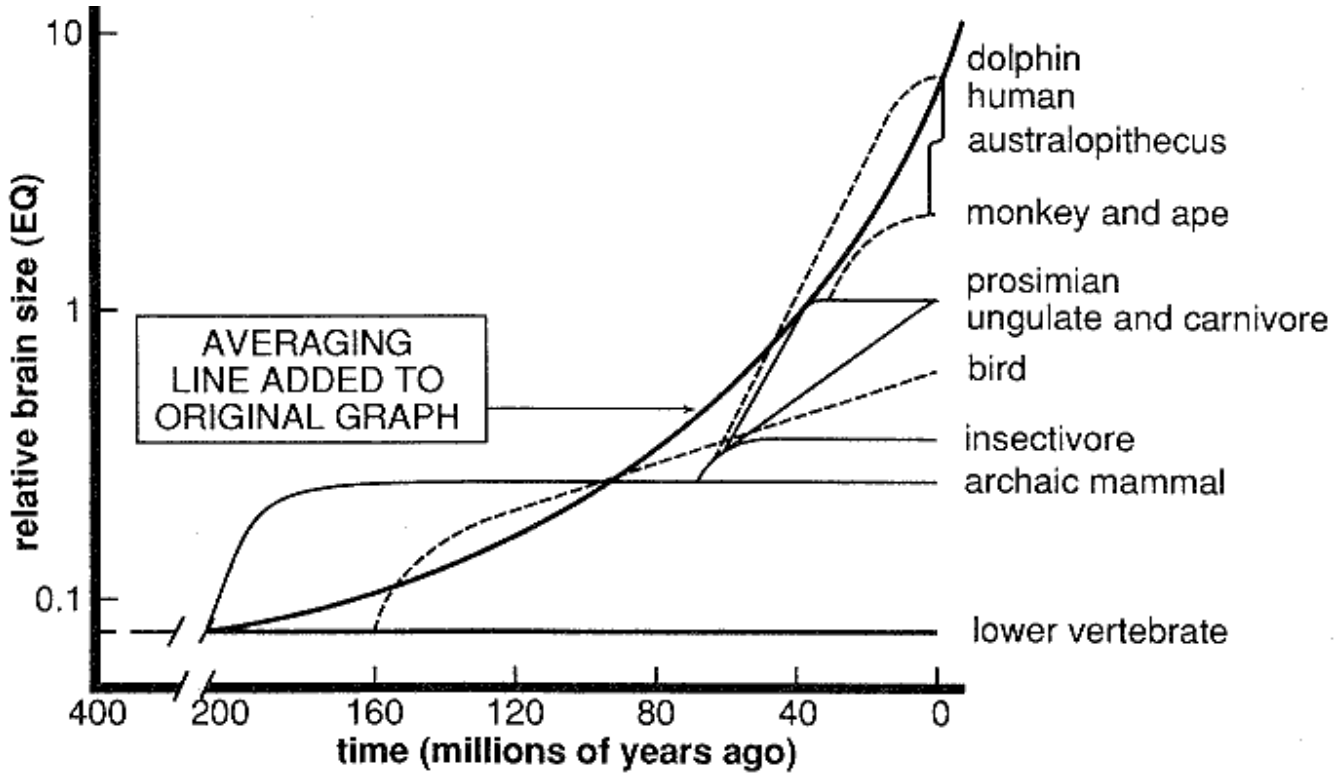
example of this. (Ref. 11.31)

Behavior in animals, as well as man, appears to be directly related to level of intelligence. We infer level of intelligence from behavior. The study of ethology, which examines and compares animal behavior, strongly suggests that behavior in both animals and man is subject to evolutionary change in much the same way. (Ref. 11.32)

If one compares the encephalization quotient of various animals, the resultant curve plotted against time is non-linear, which also supports the hypothesis that intelligence in general has increased non-linearly. An attempt to assess the relative intelligence of various vertebrate species has been made by H.J. Jerison. He first determined the relation of brain weight relative to body weight and arrived at an expression that he called the "encephalization quotient," or EQ, which is defined as 0.12 times the ratio of brain weight over body weight to the two-thirds power. The factor 0.12 was chosen arbitrarily so that an "average" mammal would have an EQ of one. Thus, lower vertebrates have an EQ less than one, and higher vertebrates above the average have an EQ greater than one. The two-thirds power was introduced into the equation because it was determined experimentally that brain weight is proportional to the two-thirds power of body weight.

EQ therefore adjusts for body weight, giving a better index of relative intelligence than one based simply on sheer brain size. Jerison then plotted on semi-log graph paper the EQs of various vertebrates against time measured in millions of years. This gave him the various rates of evolution of brain size for several animal groups, including man. Although the curve is not considered to be smooth, it is definitely non-linear. It also indicates that at least some animals other than man are

becoming more intelligent through evolution. (Ref. 11.33)



It would appear probable that an increasing number of people are experiencing higher altered states of consciousness. One-third or more of all individuals queried have reported having had a "peak experience." (Ref. 11.34) Increased intelligence allows for an increase in the experiencing of higher levels of consciousness. The greater the information stored in the brain, mind and body, the higher the level of consciousness that potentially can be experienced. During peak experience, the amount of information (stored memories in the conscious and unconscious) that is accessible to an individual for processing and integration will ultimately influence the extent of the P.E. Evidence is accumulating that the experienced perception of increased understanding and enlightenment during P.E. is valid and not hallucination. The higher degree of social concern and social

consciousness that is presently being witnessed with increasing frequency is a reflection of the upward evolution of intelligence. Our ability to integrate new and greater amounts of information is also a reflection of increasing intelligence.

Intelligence has finally evolved to the level of producing a mind which has the ability to look at itself and ultimately discover those necessary keys that could shape its own destiny. Intelligence appears to have reached a threshold where it now can consciously pursue creative ways to continue its non-linear upward evolution.

There are those eminently sane individuals who now believe that the human mind may have evolved to a new state of potential comparable to that of the emergence of language. Scientific evidence is accumulating which would suggest that consciousness can be expanded and transformed. Marilyn Ferguson has said that, "The subjective accounts have been correlated with concrete evidence of physical change: higher levels of integration in the brain itself, more efficient processing, different `harmonics' of the brain's electrical rhythms, shifts in perceptual ability." (Ref. 11.35)

Louise Young in her book The Unfinished Universe recognizes the acceleration of the evolutionary process, and even implies that it will continue. She sees the human mind as now capable of facilitating this mechanism through foresight. She states, "An exponential process magnifies in a spectacular way even very little beginnings. As the extension of the creative force of life and mind doubles and doubles again it will rapidly encompass ever-widening spheres." (Ref. 11.36)

There seems to be a new awareness of mind that Barbara Brown has even termed the Age of Mind. There seems to be a continued swelling interest in mind and consciousness and the potency which seems to exist. An increasing number of people seem to be experiencing a new

level of awareness or altered consciousness with meditation, techniques of self-suggestion, imagery, healing powers, body consciousness and other variations on the theme of mind. This reflects a new perception of mind and the powers it holds. (Ref. 11.37) Brown has also stated as her conclusion "that the cognitive apparatus that is unique to man also evolves." (Ref. 11.38) She believes that as the "intellect becomes more sophisticated, so too does the ability of mind to create more and increasingly complex states of mind." (Ref. 11.39) This can now be achieved in a variety of ways such as through various meditative processes, new learning techniques, the use of chemical agents and perhaps even with mechanical devices.

There is substantial experimental evidence that certain chemical agents can stimulate an increase in intelligence. This will be discussed in greater detail in another section; however, briefly stated, such agents as choline, lethecin and hydrazine have been found to increase standard IQ scores in various groups tested. In addition to this, problem-solving and creativity have both shown themselves amenable to the use of chemicals that have more to do with perceptual manipulation than with direct stimulation of intelligence. However, certain psychedelic drugs can result in altered states of consciousness in which novel ideas and unique solutions are perceived through a shifting of focus or perspective. (Ref. 11.40) The drugs seem to work by blocking certain receptor sites, interfering with normal neural transmissions, inhibiting the firing of cells, or stimulating the production and/or release of chemical neurotransmitters at the level of the synapses. (Ref. 11.41)

Experiments with psychedelic drugs have given mixed results, but there does appear to be a definite achievement of greater heights of creativity with their use. A group of architects given LSD under controlled conditions generated far more and better solutions to a design problem, as determined by a group of independent judges. (Ref. 11.42)

It has also been recognized by many people that the pace at which humankind is presently gaining new knowledge is increasing at a non-linear rate. We have been doubling the amount of new information accumulated every seven to ten years. This represents an exponential curve similar to others which have already been discussed.

Julian Jaynes, a psychology professor at Princeton University, wrote a controversial book, published in 1976, entitled The Origin of Consciousness in the Breakdown of the Bicameral Mind, in which he argues that humankind first achieved consciousness late in the second millennium B.C. While he was severely criticized by some, and though I don't accept his conclusion either, his case has much merit if one modifies the position somewhat to state that he has recognized a not-so-subtle, definite increase in humankind's overall level of consciousness. If people read his book with this latter premise in mind, I would speculate that many would conclude he has discovered good evidence that humankind's level of consciousness did undergo a change within that period.

The very rapid increase in human population over the past several thousand years would be additional evidence of an overall increase in intelligence. Humankind's population changed quite gradually for many millennia. Then it began a relatively rapid rise that could reflect an increasing ability to master and control the environment as well as all aspects of existence.

Abraham Maslow, past president of the American Psychological Association, and one of the leading spokesmen for humanistic psychology, identified a group of individuals that he referred to as the "growing tip." These represent self-actualizing people who appear to be better integrated, more fully functioning, and who have a greater overall awareness of the needs of humankind and become actively involved in its betterment. These self-actualizing individuals are at least in part the

result of peak experiences. Maslow saw them as an evolutionary product at the upper end of the human spectrum, and as being and becoming the best of what is potentially achievable at our present level of development. I believe this group manifests the highest level of evolutionary development within humankind and that it is an example of the continuation of the evolutionary process. (Ref. 11.43)

One of the most compelling arguments that intelligence is increasing non-linearly and even exponentially is based on the mathematical relationship already presented as derived by Shannon.

$$\mathbf{H + I = constant = H_{max} = I_{max}}$$

Since all entropic processes are occurring at an exponential rate, this would suggest that the accumulation of information within any system is also occurring exponentially. As energy in a system is dissipated through entropy, the system would appear to be gaining in information as it becomes more complex. Virtually every open system which has been identified within our universe seems to be gaining in information. Therefore since intelligence of any organism or system is directly proportional to its information content, and if information is accumulating exponentially, so should be intelligence.

I also recognize within myself a compelling need to increase my level of knowledge, and as much as possible my own intelligence. Since I don't see myself as necessarily unique, I have to conclude that others must share this need to lesser or greater degrees. Whether this need is an inborn characteristic or environmentally acquired I am uncertain. It seems to manifest itself through the emotion of interest, which has been identified as the most commonly experienced positive emotion. This emotion may very well be one of the properties of higher-order intelligence that acts as a driving motivational force in attempting to

propel intelligence continuously upward. It represents the foundation of curiosity.

Lastly, I believe that the Integrated Theory of Intelligence can explain intelligence's relationship to matter, energy, space and time better than pre-existing concepts. The universe is continually gaining in information as it undergoes evolutionary change. Since most physical processes are occurring exponentially, why not, then, expect that information accumulation and intelligence evolution might also occur that way?

The hypothesis that intelligence will continue to evolve in an upward direction at a non-linear, if not an exponential, rate is clearly the most important concept presented within the integrated theory of intelligence. If other parts fail in time, the overall theory will still be considered successful by me as long as this one concept prevails, since the ramifications of this hypothesis are the most far-reaching. It is predicted that time will eventually allow the proof to be established and thus allow scientific testing and eventual validation of the theory.

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Chapter 12
Intelligence As a Force

(10) Intelligence either guides the application of physical forces or is itself a force, thus causing or directing the motion of matter-energy, and driving the evolutionary mechanism. The expression of intelligence requires its interaction with matter-energy in our physical world.

Intelligence can arbitrarily be divided into organic and inorganic forms, which creates an artificial and presumably non-existent boundary, but using that boundary as a mental convenience allows us to discuss its properties more effectively. For example, I am now quite certain that organic intelligence, which is an inherent property of all life forms, manifests a spectrum or continuum of consciousness states, ranging from simple to complex. The level of consciousness that any organism can potentially aspire to is directly related to its degree of material complexity. I am uncertain as to whether inorganic intelligence has consciousness, although there are now eminent scientists who have concluded that all matter, including atoms, is endowed with at least some consciousness.

Intelligence oversees the operation of all forces throughout the universe. Although the distinction is again arbitrary, there are those forces which might be thought of as more associated with inorganic processes and those that are more associated with organic processes.

The physical forces that appear to have an association with inorganic processes would include gravity, electromagnetic, and both weak and

strong forces. It is also probable that additional forces may someday be identified.

The entire evolutionary process of the universe is so intricately balanced that life could not have come into existence if any of the four or more physical forces of nature had differed very much in any direction. For example, if the rate of expansion of the universe had differed from its actual value by more than 10^{-18}, the entire delicate balance would have been destroyed. The explosive vigor of the universe is matched to its gravitational power with an almost unbelievable accuracy. The initial conditions had to be very special, and the rate of expansion is only one of several apparent cosmic miracles. (Ref 12.1)

Physicist Paul Davies has referred to the "balancing act" with respect to the rate of universal expansion. He has stated, "For a given density of cosmic material, the universe has to explode from the creation event with a precisely defined degree of vigor to achieve its present structure. If the bang is too small, the cosmic material merely falls back again after a brief dispersal, and crunches itself to oblivion. On the other hand, if the bang is too big, the fragments get blasted completely apart at high speed, and soon become isolated, unable to clump together into galaxies. In reality, the bang that occurred was of such exquisitely defined strength that the outcome lies precisely on the boundary between these alternatives." (Ref 12.2)

If the strong force that binds protons to neutrons in the atomic nucleus were half its present strength, the chemical elements would decay rapidly. If this same strong force were only slightly greater, then the di-proton could exist, with the result of hydrogen being catastrophically explosive. If the weak force were slightly weaker, then neutrinos would not be able to exert enough pressure on the outer envelope of a star to cause a supernova explosion. If there were no explosions, the heavier elements which are formed inside of stars and upon which life is so completely dependent could not be liberated into the universe and be available for the creation of intelligent life forms. The explosion of a

supernova disperses matter rich in heavy elements around its galaxy. If there were very much difference in any of the forces of nature, then life would be rendered impossible (Ref. 12.3) Paul Davies also states, "When we remember that these four very different types of force, each one vital for generating the complex structures that make our universe so active and interesting, all derive from a single, simple superforce, the ingenuity of it all literally boggles the mind." (Ref. 12.4) Molecular biologist George Wald has stated, "If any one of a considerable number of physical properties of the universe...were other than it is...life...would become impossible, here or anywhere." (Ref. 12.5)

Given the necessity for all of the physical forces to be just as they are before life and intelligence could evolve, one might speculate with some assurance that these forces operate under the influence of intelligence. This would necessitate the existence of intelligence at the origin of the big bang, and this is not an impossible hypothesis. As a matter of fact, if intelligence existed at the time of the big bang, that would certainly supply answers to many questions which would otherwise go unanswered.

The forces that are more characteristic of organic processes are more difficult to define as actual forces; however, they qualify as such to the extent that they all secondarily cause the motion of matter, the expenditure of energy and the performance of work. Some of them are only apparent in higher life forms.

Organic-related forces would include:

(1) Instinct for survival. This primitive instinct most probably exists in all living tissue and is much easier to recognize in more complex organisms. It is the single most important underlying factor which impacts virtually every decision made by any

organism. A simple one-celled organism may abruptly change its direction of travel in search of a nutrient as the result of this instinct. At the other end of the spectrum, humankind also has this same basic instinct as manifested in our needs for food, shelter, love, discovery and the acquisition of knowledge; however, the presence of consciousness does occasionally allow for the overriding of it resulting in either heroic or self-destructive acts. This very strong instinct for self-preservation is the most basic underlying need or force seen throughout life forms and usually supersedes all others. It might even be viewed as the syntropic force that opposes the process of entropy.

(2) Drives. Humans, higher animals and perhaps even all lifeforms possess instinctual drives that are constantly directing or modifying behavior, which in turn results in the motion of matter, the expenditure of energy and the performance of work. A drive has been defined as an appetitive internal or intrapsychic force that is peremptory, cyclic, selective and displaceable. (Ref. 12.6) The most common drives include hunger, thirst, sex, fatigue and comfort-seeking or pain-avoidance. (Ref. 12.7)

In addition to those drives which are ordinarily recognized, Albert Szent-Gyorgyi, three-time Nobel prize winner, following years of research, has concluded that there must be an additional drive in living matter causing it to strive to perfect itself. (Ref. 12.8) Stated another way, physicist Lancelot L. White believes that each living organism has an inherent tendency or drive to internally organize itself into more and more sophisticated patterns. He sees this spontaneous intention or inner drive to be co-equal in importance with the force of natural selection. (Ref. 12.9) Drives are apparently the result of a tissue deficit or tissue change. (Ref. 12.10) They will be discussed in greater detail in a subsequent chapter.

(3) Emotions. These are similar to drives to the extent that the experiencing of them provides motivation to the organism to act with some type of purposeful behavior. They represent experiential/motivational phenomena that have adaptive functions independent of tissue needs. (Ref. 12.11) They are more free than drives and can be satisfied in a greater variety of ways. In similar fashion to drives, they cause matter to be moved, with the expenditure of energy and the performance of work, and therefore qualify as a force. Emotions will also be discussed in greater detail in a later chapter.

(4) Affect-cognition interactions represent motivational states resulting from the interaction between an affect or pattern of affects and the cognitive processes. They provide motivation for action and behavior similar to that provided by drives and emotions. (Ref. 12.12)

Most acts of intelligence occur on an automatic or instinctual level, with the organism, including man's, being completely unaware of them happening. Only in higher lifeforms does it appear that a conscious thought process originates a purposeful act. All metabolic activity within an organism, although under control of the intelligence system, would seem to occur on an unconscious level.

Dr. H. Kornhuber, a neurophysiologist in West Germany, has determined that when a conscious act of will such as a hand movement is carried out, an electrical potential (readiness potential) can be measured as a widespread phenomenon over both cerebral hemispheres that lasts about 80 milliseconds. Following this there is another electrical potential that can be measured (premonition positive potential) over both cerebral hemispheres about 90 milliseconds prior to any body movement. Then finally, another electrical potential (motor potential) can be recorded directly over the hand area of the opposite side within

the motor cortex about 50 milliseconds prior to a hand movement. (Ref. 12.13)

Thus the act of will begins with the thought process that is somehow integrated with our intelligence mechanism. It is presumed that a conscious decision first results in a redirection of molecular activity within the brain. There is actual alteration in the molecular structure of certain cells within the cerebral cortex. Certain atoms (a large number) are raised to an excitable state, which then results in the formation of an electrical potential within a group of controlling cells, that in turn causes an electrical current to flow through a series of neurons. This electrical signal is biochemically transmitted across many synaptic junctions and then through more neurons until finally the appropriate muscular contractions cause the hand to move. Thus any body movement is the sum total of an automatic chain reaction of physical events that our mind (intelligence) both initiates and controls. In a sense, this could be considered to represent an example of "mind over matter."

There are many scientists who are now convinced that the newer concepts of physics imply that the human mind is an independent, irreducible agent and source of action. It has the power to make choices and exert free will. Weizsacker has been quoted to say that, "Freedom is a prerequisite of the experiment. Only where my action and thought are not determined by circumstances, urges or customs but by my free choice can I make experiments." (Ref. 12.14) Matter cannot be understood without introducing mind.

One of the innate properties of intelligence is its inherent drive for self-organization and need to continually achieve higher levels of complexity. In association with the instinct of survival, this principle drives the entire evolutionary mechanism. Intelligence is constantly experimenting with novel ways to construct higher- level systems that are complementary to the co-evolving environment. All isolated systems

as well as their surrounding environment are under the influence of intelligence as they co-evolve.

Ilya Prigogine, a theoretical chemist and Nobel prize-winner, has written a book titled Order Out of Chaos, expressing the dominant theme that the world is self-organizing and is moving constantly in the direction of higher order. If one accepts the big bang theory as an approximate description of the beginning of our universe, then it becomes necessary also to accept the premise that matter-energy was in a highly disordered, chaotic state. This would then imply that order out of chaos must have occurred to bring us to our present state of evolution.

Richard E. Leakey has made an interesting observation: "[G]reat apes, particularly chimpanzees, appear to be much more intelligent than they have any need to be: the sophisticated challenges invented for them by experimental psychologists, to which they respond with such ingenuity, are at any rate far from what they are likely to meet in their natural habitat: this paradox poses problems for us in explaining the origins of human intelligence." (Ref. 12.15) This apparent paradox can be explained if one accepts the premise that there is an organizing force behind evolution propelling it forward and that it is seeded in intelligence.

Geneticists believe that genetic variations in life are so abundant that chance alone will allow some to survive in competition with the environment. This, however, does not begin to explain how the successful genetic materials become integrated with existing systems or become convergent to produce effective, harmoniously acting wholes. The process of unifying the functions of very different cells and tissues, so that they are always propagated synchronously or together, suggests that some higher mechanism or unknown medium acts to keep cells and tissues organized in the right way. If the genetic material that determines which organism survives is merely the result of chance, then it would seem that more complex animal forms would take longer to evolve. This

is exactly the opposite of what appears to be happening. Complex life forms have evolved much more rapidly than the simple life forms. (Ref. 12.16)

Alan Garfinkel, after closely studying the slime mold that commonly coats the surface of stagnant ponds, concludes that it demonstrates the same principle of self-organization which others have concluded is so prevalent in nature. This organism has two life phases. It first is a single-celled amoeba leading its own individual existence; however, when deprived of food it undergoes a radical transformation and organizes into a colony of thousands of cells. Each colony becomes one differentiated animal with a head, back and stalk. The body then becomes spores covered with hard cases. They break away, and the cases crack open liberating individual amoebas, completing the life cycle. (Ref. 12.17) The properties exhibited by the slime mold emphatically exceed the sum of its individual parts. (Ref. 12.18)

Not only does there appear to be a self-organizing force behind all living systems, but this same tendency is seen to exist within inorganic matter. Stars strive to become more complex with information as they manufacture higher atomic weight inorganic molecules. Atomic particles possess this same quality on a primitive level as they try to preserve themselves or regenerate after being perturbed. (Ref. 12.19) This tendency was present before the first living cell was formed. The atom recaptures its lost electrons, the crystal when traumatized restores its fractured shape, and the molecule discards excess energy forced upon it by random encounters. (Ref. 12.20)

The presence of a self-organizing force involving inorganic matter is also manifested in the Belousov-Zhabolinsky reaction. This occurs when four specific chemicals are mixed together in a shallow dish at a specific temperature. The mixture will self-organize into a structure of concentric and spiraling waves that spread and pulsate with clock-like

regularity and change colors at precise intervals. This process is entirely chemical yet resembles somewhat the action of a living system. (Ref. 12.21) Organic and inorganic self-organizing units are not only passively pushed and pulled by outside forces, but possess inner resources that act to preserve themselves. (Ref. 12.22)

Do mutations occur randomly, as has always been assumed, or is there a positive driving force inherent in intelligence, and also manifested within the genetic code, that is continually modifying its structure to allow new adaptations to be processed through natural selection? The continued upward evolution of life forms overcoming entropy would seem to indicate that there must be such a force. Intelligence as a force in opposition to entropy is propelling evolution in an upward direction and has been referred to by others as the principle of self-generating complexity. It would appear to be accomplishing this in part through the instilling of a strong instinct for survival in all living organisms. The entropic process in a sense opposes the upward evolution of intelligence, but is also beneficial in that it forces intelligence to express itself in an almost infinite number of ways. The entropic process diversifies the ways that intelligence manifests itself by inducing mutations and eliciting an anti-entropic repair process based on the principle of self-organization.

Entropy is a basic property of the universe which, undoubtedly, is occurring everywhere that humankind has been able to observe. All isotopes in existence are disintegrating with a predictable half-life. All stars are giving up energy to surrounding space. There is a definite tendency for all non-living materials to disintegrate, such as rocks crumbling and dead organic material decaying. Yet we see an evolving universe where order is forming out of chaos and the simple is becoming more complex. Not only are life forms evolving, but complex inorganic molecules are continuously being manufactured inside stars. This

implies, therefore, that opposing processes are occurring and that both are necessary as the universal process unfolds.

Entropy makes it possible for the anti-entropic principle to continuously restructure by-products of entropy into yet more complex forms. One certainly could not exist without the other. This anti-entropic principle accounts at least in part for the organizing force behind evolution. Since there is unquestionably a natural tendency for things to decay or disintegrate, there must also be an opposing tendency to overcome that downgrade process if things are to swim uphill and become more complex. It would be absolutely impossible through random variation for the universe to become more complex if such a tendency or principle did not exist.

Life forms are constantly being challenged by both biological entropic and physical entropic processes. Biological entropic processes refer to the invasion of more complex life forms by other, simpler organisms such as viruses, fungi and bacteria. Physical entropic processes refer to the attempted destruction of life forms by such things as the bombardment of an organism by electromagnetic radiation or high intensity sound waves, or the ingestion of toxins and other foreign inorganic substances.

In all living tissue there is a profound unity. A.I. Oparin has written, "The organism maintains its form, structure and chemical composition unchanged while its material is continually changing." Metabolic activity requires the breakdown of one substance and the build-up of another. (Ref. 12.23) Somehow the integrity of the whole organism is preserved throughout its life, even though there is a constant interchange of atoms and molecules. Large molecules are organized into living organisms that are open systems in a steady state of continual interchange with their surrounding environment. By tracing radioactive isotopes it has become possible to demonstrate that there is a rather

rapid turnover and exchange of atoms and molecules within any organism. The matter comprising each and every cell does not remain static for long, but is broken down and eliminated, being replaced by new atoms and molecules. Many cells themselves live for only a few days before death and replacement. (Ref. 12.24) Even though its matter is in a constant state of turnover, the organism, including man, maintains its integrity throughout life.

This rapid turnover of matter is also constantly occurring within the human brain. It is a self-organizing information system rather than simply an information-handling machine. The fact that the turnover of atoms and molecules within the brain is occurring continuously with so little relative change in its stored information content (memory) is again seen to be evidence that intelligence (mind) has spatially related properties which go beyond its material content. The mind cannot simply be reduced to brain. It can be deduced that an evolving intellect is the agent that redirects the evolutionary process from a chance, mechanical process of survival to a discriminating, information-processing, self-directing faculty. (Ref. 12.25)

There are a great number of complex functioning systems in lifeforms which appear to have an "all or nothing" characteristic, which have evolved over time, and which are extraordinarily difficult to explain if one tries to conceptualize a way that they might have occurred either gradually or by chance. One such example commonly referred to is the eye. It is a highly complex integrated organ requiring perfect interaction between the cornea, lens, intraocular muscles, retina, optic nerve and other anatomical structures. The coordinated effort required of each separate structure for the eye to operate is astronomically awesome. Darwin himself was plagued by this dilemma and as yet no one has begun to satisfactorily explain how the eye or other complex organ system could have evolved simply through a process of natural

selection. Any evolutionary change in one of the component parts necessarily requires coordinated changes in the other parts as well.

The male and female reproductive systems also fall into the same category. One of the most perplexing questions in need of an answer pertaining to the evolutionary process is how it could have been possible for male and female animal forms to have evolved separately from each other, yet complementary to each other, and totally dependent upon each other. Given the extreme complexity of the sexual and reproductive system, it would seem to be statistically impossible for both male and female systems to have evolved without the presence of an organizing force. We are not even talking about a single set of complementary reproductive systems, but a great variety of them spread throughout all of nature. Even if a sperm-producing testicle with accompanying vas deferens and penis could have arisen by chance through natural selection, how would it have been possible for an egg-producing ovary with accompanying uterus, fallopian tubes and vagina to have arisen concomitantly and simultaneously? These occurrences fall well beyond random statistical mathematical probabilities. For every change in one system there would have to have been a corresponding complimentary simultaneous change in the other.

There are many other examples of the "all or nothing" principle to be seen in the evolutionary process. The structure of a bird's wing is very complex. Half a wing would not give any survival advantage, and wings would not have worked at all if complementary muscle and bone structures had not evolved along with light-weight feathers and a nervous system that allowed its function. (Ref. 12.26)

There can be no question about the presence of an organizing force behind the evolutionary process, a force that science and other disciplines can no longer continue to ignore. Intelligence had to organize matter into increasingly complex forms, first inorganic and then organic,

before it could evolve the other material components needed for higher life-organisms.

Many biologists have come to accept the premise that there is an underlying purposiveness within nature. Oparin has stated, "The universal `purposiveness' of the organization of living beings is an objective and self-evident fact which cannot be ignored by any thoughtful student of nature." (Ref. 12.27) Birds build nests to house their young. If a kidney is surgically removed from a human, its second one hypertrophies so that it can approach doing the work of two. The immune system exists to fight off any invading microorganisms which attack the body. The eye evolved for the purpose of picking up images of the surrounding environment. Purpose is best known to us in our own actions. We can freely choose which direction we wish to pursue and then execute our plans. (Ref. 12.28) I chose to write this book, as masochistic as it sometimes seemed.

All organs of every plant and animal exhibit purpose. Each is designed to perform a specific task or tasks. No organ can be properly defined or understood without examining its purpose, which is the activity it performs. (Ref. 12.29) According to Robert Augros and George Stanciu, "Purpose permeates every aspect of life. The metabolism of every cell is ordered to the organism. Growth is aiming at the completeness of form. The organ-tools of animals and plants, the capacity for self-repair, the findings of ethology and ecology, all point to purpose. With elegance and economy, nature subordinates means to end. Matter is for the sake of form, and both are for the sake of operation. Every cell, every tissue, every organ serves a purpose. Every animal, every plant directs its activities to an end. The whole of nature is ordered by purpose." (Ref. 12.30)

Intelligence is endowed with another property manifested as an intense desire to understand itself. This is presumably a property which is of

relatively recent origin on this planet, probably present for the last few thousands of years and probably restricted to humans.

Matter-energy and intelligence are constantly interfacing and interacting, and they influence each other to a very great degree. Intelligence would nevertheless appear to dominate, as evidenced by its continued upward evolution. It would appear to be capable of manipulating matter and energy, thus setting up a process by which it can continuously evolve to higher states of consciousness. It seems apparent that extremely complex and strategically placed atoms and molecules are a requirement for life to exist in its present form, and for consciousness to manifest itself in this dimension.

Given the great abundance of scientifically validated information, there can no longer be any significant doubt that intelligence guides the evolutionary process and directs the application of a variety of forces which we have identified as existing in nature. Chance alone falls far below the mark as an explanation for our existence, as well as for that of the rest of the material universe.

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Chapter 13

Influence of Environmental Factors Upon the Evolution of Intelligence

(11) The level of intelligence reached by any organism or species is partially dependent upon the sum total of all physical forces operating within the surrounding environment. All life forms and their bodily functions have been molded and shaped by the surrounding physical forces that are constantly acting upon them. Every life form (organism) is in part the product of the sum total of all of the physical forces that have helped direct and shape evolution. Thus the pressures of all physical forces, as a process of entropy, have strongly influenced the upward evolution of intelligence.

The impact of the weak and strong forces has been alluded to already, and they primarily influence life forms at the atomic level. The electromagnetic and gravitational forces produce effects which we can more easily observe at our own level of existence.

The presence of gravity has helped mold the size and shape of all life forms and has also influenced the development of muscle and bone strength and joint architecture. The nervous systems of all organisms have evolved to allow them to operate in a gravitational force field. Each animal has many adaptational attributes which allow it to run, jump, fly, climb, float or swim and which would not be necessary if there were no gravitational force present. There are a great number of other ways that could be listed to demonstrate how the force of gravity has affected the evolution of all life forms and at least indirectly influences their intelligence.

There have been many discoveries as to how electromagnetic forces influence all living organisms by producing or modifying their behavior. Long-lasting changes in brain cell membranes have even been observed as the result of electromagnetic forces. (Ref. 13.1) The brain itself generates a weak electromagnetic field which can be monitored by performing a magnetoencephalogram. (Ref. 13.2)

Since the human brain as well as the entire body has an electromagnetic field, anything which perturbs that field will necessarily influence the brain and body. All living organisms likewise have an associated electromagnetic field, and will be influenced by anything which perturbs that field, including all other interacting outside fields. (Ref. 13.3)

Herbert Pohl has detected the presence of faint electromagnetic radiation emitted from the cells of people, animals, plants and bacteria. This radiation is in the radio frequency range. In addition, he reports that the radiation is especially strong during cell division. (Ref. 13.4) In similar fashion a West German chemist and physicist, Fritz-Albert Popp, has demonstrated that living organisms also emit extremely weak light. This biophoton radiation is in the infrared and ultraviolet range. Growing cells appear to radiate more intensely than developed ones. (Ref. 13.5) A Polish physicist, Janusz Slawinski, has also determined that at the time of death the electromagnetic biophotons are emitted with an intensity that is 10 to 1,000 times greater than normal. The intensity and duration of the radiation is dependent upon the rate of dying. From his work, he has proposed that the electromagnetic field of any organism might structure matter by imposing organization, and patterning molecular association. (Ref. 13.6)

We are beginning to discover the different ways that the earth's magnetic field influences living organisms. Biologist Richard Blakemore, in 1985, discovered that certain bacteria orient the direction in which they swim

by utilizing the magnetic North Pole in the northern hemisphere and the magnetic South Pole in the southern hemisphere. (Ref. 13.7) Birds are also able to use the earth's magnetic field to help orient themselves and they use this special ability to navigate during flight. Other animals including bees, dolphins and whales have similar navigational abilities by utilizing the earth's magnetic field.

Apparently humans have also been shown to have a magnetic sense of direction similar to pigeons. Robin Baker, of the University of Manchester in England, blindfolded a group of zoology students and drove them over a complex, winding road distances of six to 52 kilometers. They demonstrated a high degree of accuracy in being able to orient their general direction from their point of departure. They were considerably more accurate while blindfolded than when not. A group of students were also tested with true as well as dummy magnets strapped to their heads. Those wearing true magnets were not able to match the homing ability of the others. (Ref. 13.8)

NASA has devoted time and effort to determine the effect of magnetism on humans. It has been found that electromagnetic fields probably influence human emotions by the modulation of currents flowing through the brain and body. Our emotional state strongly influences our behavior. (Ref. 13.9)

We are actually surrounded and permeated by several fields that indirectly, if not directly, affect us in certain ways. These would include the isoelectric static field of the planet; the magnetic field of the earth; the electromagnetic field; gravitational fields of the earth, moon, sun and neighboring planets as well as distant stars; the electromagnetic fields created by humans such as the different broadcasting fields of radio and TV; and the electrostatic fields of our own bodies and other organisms. (Ref. 13.10)

Since all living organisms are probably affected by magnetic fields, anything that influences those fields will indirectly or even directly perturb living organisms. The sun, for example, is constantly influencing the earth's magnetic field. The solar wind is continuously distorting the lines of force within earth's field by causing them to become compressed on the side facing the sun and elongated and stretched on the far side. Magnetic storms produced by solar flares seem to affect atmospheric conditions, and may in turn influence weather patterns. (Ref. 13.11) There are those meteorologists who are convinced that the varying magnetic field does influence temperature and rainfall, as well as the nitric oxide and ozone content of the atmosphere. (Ref. 13.12) These in turn secondarily affect all living organisms. The earth has a very large variety of different physical environments produced by interacting physical conditions, including moist, dry, tropical, frigid and aqueous in various combinations. These widely diverse environments have forced the adaptation of life forms into an almost-unlimited variety; and the intelligence system of each one reflects this process.

Earth's magnetic field follows several cyclical patterns. Its field strength rises and falls every 24 hours. It also cycles monthly in phase with the tides. It apparently also reverses its direction 180 degrees every so many hundreds of thousands of years. It has been shown that this reversal has caused the extinction of at least one organism, radiolaria, again emphasizing the impact of the magnetic field upon life forms. (Ref. 13.13)

Our entire existence is based on the interaction of a great number of different types of wave-form phenomena. Virtually everything in existence would appear to be cyclic, oscillating between extremes. Wave-form phenomena are seen at all levels from the subatomic to the macroscopic.

When sets of waves interact they produce an interference pattern much like that of a hologram. A living organism, including a human,

oscillates. An oscillator vibrating at different frequencies from other oscillators can, over time, get locked into phase through rhythm entrainment. It then will resonate. Our reality is constructed by our brain as it interprets the differences, or interference patterns, in all of the various electromagnetic and sound waves which are constantly being perceived by the totality of our bodily sensing devices. (Ref. 13.14)

Systems theory recognizes the rhythmic patterns present at all levels. Atoms are patterns of probability waves; molecules are oscillating; and all organisms are multidimensional, interdependent patterns of fluctuations constantly undergoing various cycles. The planet also has its rhythms and cycles as it both spins and moves around the sun. (Ref. 13.15) Our reality is a creation of the brain as it translates and integrates the many types of oscillating vibratory patterns picked up by our senses. (Ref. 13.16)

Life has proliferated in every conceivable direction by adapting to all possible locales. The limits have been set by all physical forces operating on the surface of our planet.

Every animal's behavior is heavily influenced by the sum total of all bombarding, interacting, outside, natural physical events acting upon it and perturbing its intelligence. In higher life forms there is a constant interplay between consciousness and its exercise of free agency and the competing external events that are continuously nudging the organism in many different directions. Any organism's effective intelligence is not static but varies over a period of hours, days, weeks, months and years, depending upon environmental conditions, built-in biorhythms and other competing physical forces. Any life form and its resultant intelligence reflects the sum total of all existing physical forces that have acted upon it, not only from planet Earth, but from the rest of the universe as well.

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Chapter 14

Consciousness As an Attribute of Intelligence Existing Along a Spectrum

(12) Consciousness is an attribute of intelligence, which exists as a spectrum and is not limited to humans. Of all the properties that are manifestations of intelligence, the one which is greatest in importance above the rest is the attribute of consciousness. This is because consciousness results in, or allows, self-awareness. It is self-awareness that is an absolute prerequisite for our perceived existence. Without it we would cease to be human, and there would no longer be a need for matter-energy or space-time. The universe could be a complete vacuum and no one would care. There could be no "higher power" of any nature since one would surely have to be at least as conscious as humankind. That makes consciousness the single most important attribute to all of existence. All the physical forces of nature, which are constantly perturbing our entire material existence, would be unnecessary.

There is simply no possible way of doubting one's consciousness. As Descartes in 1629 wrote, "Cogito, ergo sum." "I think, therefore I am" must be true. The inability of science to prove the existence of consciousness is a weakness or criticism of science and not of consciousness, which screams loudly of its own existence. For me to be able to think that I am conscious requires, by definition, that I be conscious.

The more brain research that is done, the greater the accumulation of evidence which indicates that mind or consciousness cannot be reduced

to the physical brain. Hidden variables are present that simply cannot be explained on the basis of its physical electrochemical structure alone.

The British neurologist, Cyril Burt, has stated that, "A comparison of the specific micro-neural situations in which consciousness does and does not arise suggests that the brain functions not as a generator of consciousness, but rather as a two-way transmitter and detector, i.e., although its activity is apparently a necessary condition, it cannot be a sufficient condition of conscious experience." (Ref. 14.1)

Modern biophysics demonstrates that the body is a volatile, fluctuating electromagnetic field, or actually an infinitely interlocked series of fields within fields. This begins to give shape to a mind-body model of consciousness in close physical interaction with the brain. (Ref. 14.2) Wilder Penfield's belief that consciousness and the physical brain are discrete but in interaction with each other would appear to be increasingly probable. (Ref. 14.3)

It is as difficult to define the properties of consciousness as it is to define those of intelligence. Certain of its attributes would also be prerequisites. Those properties that one might include as pertaining to consciousness are the following:

(1) Self-awareness is that property which refers to the awareness of being aware of self. (Ref. 14.4) As indicated before, this must be the most important attribute of consciousness, for without it there is no longer any reason for any other facet of existence. We do not yet know whether this represents a threshold phenomenon or is a continuous spectrum involving all other organisms and systems. However, there is very good evidence which indicates that some primates, if not certain other mammals, possess self-awareness.

Chimpanzees in particular show evidence of consciousness or self-awareness. Jane Goodall, who spent years observing the behavior of chimps in their natural habitat, tells us of a female chimpanzee who allowed all the males in the group to mate with her except for her two grown sons and her brother. A social distinction of this nature requires a very good knowledge of the identity of all group members, as well as an awareness of their long-term relationship to herself. (Ref. 14.5)

Lyall Watson cites experimental evidence of awareness in other animal species besides humans. He described a study performed at Harvard University using pigeons that were trained to peck at one of a number of disks if a human was identified as being present in a series of photographs that they were shown. It was found that the pigeons could correctly find the humans in the pictures whether they were clothed or nude, young or old, black or white, or in any posture. They were capable of this recognition even if the most fragmentary aspects of the human form were present, such as a hand, foot, or the back of a head, and even though it was at a distance. The stimuli were so varied and complex that no simple conditioned response could account for this ability. The conclusion drawn from this experiment was that the pigeon is capable of forming a broad and comprehensive concept. This bird is capable of awareness of other life forms, which is a prerequisite of self-awareness. (Ref. 14.6)

It has become the belief of some researchers that the higher cortical centers of the human brain act as the data bank for sophisticated unconscious information or memory storage and that conscious awareness, choice and reflection may reside in the older limbic brain. (Ref. 14.7) If so, this would be evidence that at least some higher non-human animals have the necessary brain hardware that would allow them to experience consciousness.

Lesser life forms might also possess this attribute, although there is no good scientific data to support such a view. Fritjof Capra has stated that he believes awareness is a property of mentation at any level of complexity from single cells to higher-level animals, and there are others also who have stated a similar belief. (Ref. 14.8)

All aspects of our human existence are the result of the evolutionary process, including emotions, instincts, drives and consciousness. It is highly improbable that any of these things suddenly appeared in man without having been present in other life forms. As I have continuously observed higher animals, there is no longer any doubt in my mind that they have all of the above, including emotions and consciousness.

Konrad Lorenz also has indicated that the appearance of self-awareness is an evolutionary development. He suggests that the older physical, physiologic systems of the brain, which earlier during the evolutionary process functioned more independently of each other, interacted and fed back information to each other, thus resulting in an interacting system with the new characteristic we now see as cognitive mind. This new system of mind evolved with the completely new ability to appreciate itself (self-awareness), and to assume supremacy over its antecedents, the physical systems of the body. (Ref. 14.9)

Self-awareness is primarily absent during sleep; however, basic mental functions continue, including perceiving, feeling and acting. These are the same basic mental functions seen in infants. (Ref. 14.10)

(2) External awareness is that property which refers to the awareness of objects and events outside of ourselves. This is as

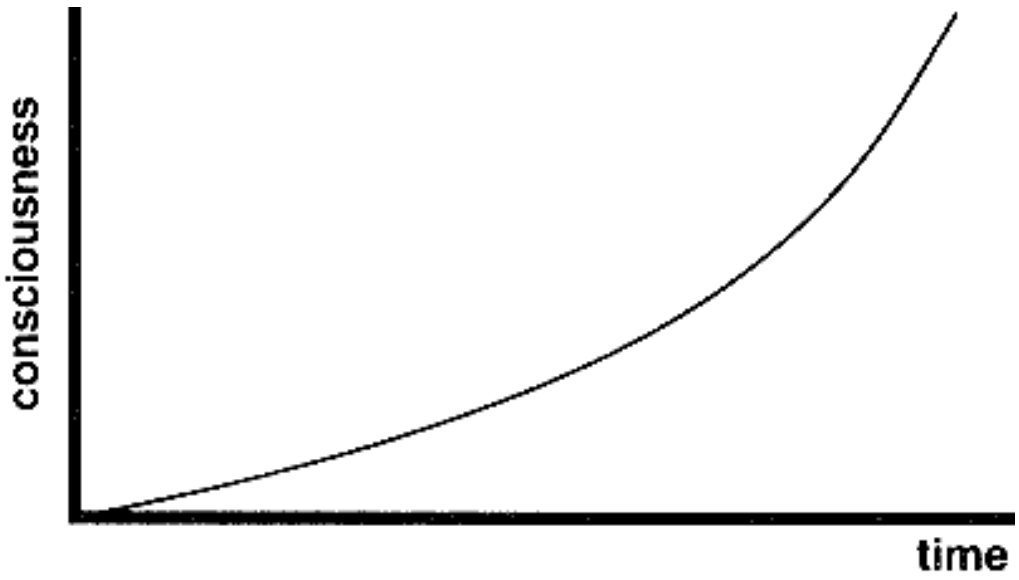
essential as self-awareness, since without it we could no more know self-awareness than to know white without black or love without hate. External awareness is at the opposite end of the spectrum from self-awareness. To be able to experience self and external awareness, there must be a focusing of intelligence and consciousness into a separate entity. This doesn't necessarily mean that each consciousness can't also be a part of a higher, hierarchical consciousness network just as an individual self-contained cell is under control of a larger organ-system complex.

Although my own self-awareness has remained essentially the same since age 3 or 4 years, I perceive that my external awareness has increased along with my overall level of ordinary consciousness. This seems to reflect an increase in the amount of stored information in both my conscious and unconscious mind. My higher level of ordinary consciousness would also seem to be directly proportional to my mind's ability to perceive all aspects of my external environment from the microscopic to the macroscopic. The greater the amount of incoming information pertaining to my external environment that my mind can process simultaneously per unit of time, the greater my level of ordinary consciousness. Every aspect of my environment is being continuously and unconsciously monitored by all my bodily sensing devices.

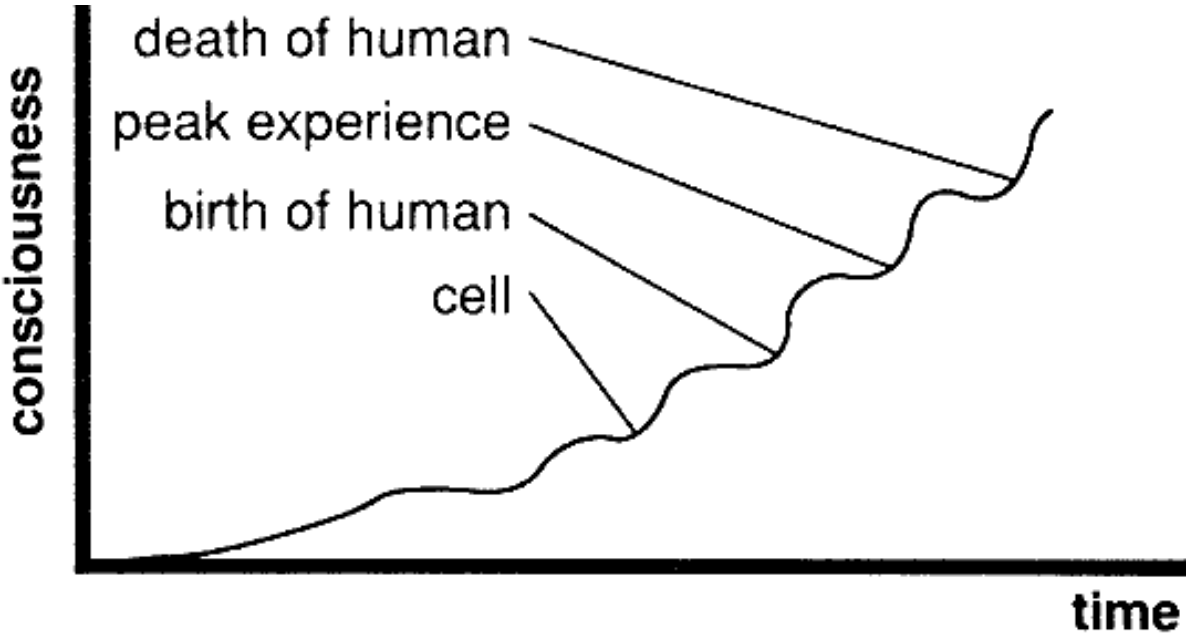
(3) Purposiveness is that property which refers to the manifestation of an active organizing principle. Many examples of purposiveness are alluded to throughout this book, some of which were discussed in Chapter Twelve. It has been stated that the more we study about the mind-body connection, the greater the need to postulate consciousness as an active, organizing principle that coordinates

the divergent functions of the physical brain in a focused and purposive manner while operating at the quantum level. (Ref. 14.11)

(4) Consciousness is hierarchical, being present at different subsystems levels. At the human and higher primate level there is self-awareness; however, as one travels down the evolutionary ladder, self-awareness is probably replaced by an awareness which doesn't differentiate between self and the external environment. If the evolution of consciousness involving lifeforms is plotted on a graph, it might resemble the same smoothly rising continuum that was seen when the evolution of intelligence was discussed,



or, one that undulates as it rises while manifesting various thresholds. (See graphic on next page).



Intelligence, if not consciousness, is present at all levels of existence from the subatomic to the macroscopic. It manifests itself in a great variety of ways depending upon the level at which it is functioning. Each hierarchal level represents a subsystem and each subsystem is a part of a larger system. Awareness could possibly be experienced at all levels, but is likely confined to the subsystem within which it functions, at least below our own level. Each individual, intelligent subsystem could be aware of its existence to a certain extent, but probably doesn't experience a sense of self as much as a sense of common or shared existence as part of a greater whole.

There is probably a threshold between hierarchies. Birth and death probably represent thresholds for us. The threshold phenomenon (not necessarily referring to consciousness) is seen at all levels of existence and would include such things as photons leaving electrons, electrons leaving atoms, matter changing into energy, atoms leaving molecules, molecules leaving protein structures, protein structures leaving the cell, cells dying within organs, birth and death of human and other animal organisms, planet escaping

from a solar system, birth or death of a sun, birth or death of a galaxy, etc.

The hierarchal properties of intelligence have been expressed in terms of General Systems theory. According to Systems theory, mind or consciousness is characteristic of all living organisms, but is not limited to individual organisms since it extends to social and ecological systems as well. Societies and cultures are seen to have a collective mind or consciousness, as well as a collective unconsciousness. Individuals help shape both, and in turn are influenced by them. Planetary and cosmic levels of consciousness are also perceived to be present. (Ref. 14.12)

Systems theory also extends the concept of consciousness toward the microcosm, and would endow all matter to the subatomic level with this property. (Ref. 14.13)

Gregory Bateson has proposed that mind is a necessary and inevitable consequence of a certain complexity which begins long before organisms develop a brain or higher nervous system. It is an essential property of living systems. Both life and mind are seen as manifestations of the same set of systemic properties. Mind and matter no longer are seen as separate fundamental entities, but rather represent different aspects of the same universal process. (Ref. 14.14) At low levels of complexity mentation is observed as behavior, and at higher levels it takes on the more characteristic qualities of mind. Social and ecological systems represent larger manifestations of mind, of which individual minds are only subsystems. The environment is seen as not only alive but also mindful. (Ref. 14.15)

There are various levels of mind, or mentation, in a living organism that contains multi-leveled systems. There are levels of "metabolic" mentation involving cells, tissues, and organs; and there is a "neural" mentation of the brain which consists of multiple levels corresponding to different stages of animal evolution. The human mind represents a phenomenon comprising a totality of multiple levels of mentation, of which we are only minimally aware in ordinary states of consciousness. (Ref. 14.16)

Intelligence has learned to understand all there needs to be known about each hierarchical level of existence. It has learned, if it didn't already know, how to direct the use of energy and move matter at each and every level. It understands how to use the physical forces in existence, and could even perhaps have designed them. Intelligence had to be successful at every level of existence before its evolution could continue to advance to its present form.

(5) Consciousness level, as it relates to material existence, is heavily dependent upon information content, and represents an awareness of stored information. The level of consciousness that any organism may potentially experience is directly proportional, either linearly or non-linearly, to its information content stored in memory. The actual level of consciousness achieved by any organism is proportional to the rate at which it can process or integrate that information. The more bits of information that can be simultaneously and instantaneously integrated or processed per unit of time, the higher the level of consciousness experienced. These concepts might be expressed mathematically:

Level of consciousness potentially achievable $\propto$ total information content.

Actual level of consciousness ∝ rate of information integration (number of bits of information processed per unit of time).

The evolution of intelligence and consciousness has paralleled the evolution of organisms with higher information content. This might also be stated mathematically:

Total bits of information stored in memory = number of bits of information for which there is awareness (consciousness) + number of bits of stored information for which there is no awareness (unconsciousness)

OR

Total intelligence quotient of organism = conscious information plus unconscious information.

John Griffith has calculated that the lifetime capacity of the average human memory is approximately 10^{11} (100 trillion) bits of information. John von Neumann has indicated that he believes the human brain has a memory capacity of 2.8 times 10^{20} (280 quintillion) bits. (Ref 14.17)

Any state of intelligence or consciousness would appear to be very much dependent upon the status of the brain and its ability to function and retrieve stored information. Brain damage from any cause can lead to loss of memory, difficulties in vision, hearing, speech, reading, writing and other components of our everyday conscious experience. Malfunctions of the brain can also result in

illusions and hallucinations. Conscious experience is so dependent upon the brain that it can be altered by the use of many drugs. Our perception of reality at any given instant in time is affected by a very large number of physical factors that constantly perturb our brain and alter our ability to retrieve stored information.

Consciousness appears to be very dependent upon memory. Patients with Korsakoff's disease are unable to form new memories and are very limited in their ability to call up remote memories. They also appear to live in a world where their level of consciousness is drastically reduced. Accessibility to stored memories would appear to be a prerequisite to conscious experience. (Ref. 14.18)

There is also a rare, post-encephalitis syndrome that illustrates the importance of brain function and memory relative to the experiencing of consciousness. One musician who was afflicted with this disorder lost his ability to perceive time as a continuum. Although he continued to experience normal self-awareness, his memory for any events occurring in his life was restricted to approximately the last 2 minutes of any awakened period. He continuously lived only in the present so that his consciousness was reduced to moments. Every time he would see his wife, which would be several times each day, he would joyously greet her as if he hadn't seen her in years. He still had all of the emotions and passions of a normal person, remained perfectly lucid and continued as highly intelligent. Nevertheless, he had lost all previous conscious recollection of his past life, even though he could still continue to perform as a musician. He had no past to remember nor any future to anticipate. (Ref. 14.19)

E.R. John has attempted to define consciousness as "a process in which information about multiple individual modalities of

sensation and perception is combined into a unified multi-dimensional representation of the state of the system and its environment, and integrated with information about memories and the needs of the organism, generating emotional reactions and programs of behavior to adjust the organism to its environment." (Ref. 14.20)

One of the most important principles of nature which is becoming increasingly understood is that everything in existence is interrelated in many ways, and what humanity has continuously been doing is to gradually define and understand those ways. The more relevant information that we store away in our mind-brains, the more accurately we are able to define our existence. We are gradually gaining greater and greater amounts of understanding about everything that we perceive to be present within the universe. The greater our understanding, which we are continually increasing through a positive effort, the more expanded our consciousness becomes.

The collective experience of all intelligence at all levels throughout the universe has perceived an almost infinite number of events. Microorganisms may gain at least a limited understanding of their surrounding environment by unconsciously "experiencing it," just as we humans do. All levels of the earth's outer shell have been "experienced" by an almost infinite variety of life forms over the past several billions of years.

This stored information is captured and passed on in our genetic codes so that our bodies and minds have unconscious access to it. Our conceptual understanding of the molecular level probably stems in part from preprogrammed information passed on to us genetically from previous lower life forms. Instinctual behavior results from inheritance of stored information which is unconscious

to us. The way in which we perceive the reality of our existence is probably influenced by genetically transmitted information passed on through billions of generations of evolution. Each organism eventually dies, but its genes are somewhat immortal in that they are continuously passed on from one generation to the next. Morphogenetic fields, as proposed by Sheldrake, may also play a role in the transmission of information from one generation to the next.

6) Consciousness represents one end of a spectrum with unconsciousness or lack of awareness at the other end, i.e., black-white, love-hate, hot-cold, and wet-dry. The vast majority of information stored in memory is contained within the unconscious and becomes partially accessible to consciousness only during altered states of consciousness.

It has only been during the last several generations that there has arisen a body of scientific evidence supporting the conclusion that each of us has an unconscious aspect to our mind. But there are those who still question its existence, even though there no longer should be any doubt.

Our unconscious mind contains an enormous amount of information of which we are mostly unaware. Occasionally we experience rather dramatic demonstrations of its existence. There is evidence that we largely retain unconscious memories of all prior life experiences, perhaps even including those related to birth or before, although substantial controversy exists pertaining to this concept.

An impressive experiment that Lyall Watson was personally involved in was conducted to try to determine the extent of

unconscious memory. A group of subjects were each given a minute's exposure to a large collection of unrelated objects followed by a five-minute pause. Each was then given both written and oral examinations to test for memory to determine how many objects each person could remember. There was a vast difference in the various scores obtained. All the subjects then were hypnotized and again tested to determine how many of the unrelated objects they could remember. The difference in scores was almost completely erased. All but one of the individuals demonstrated an equal and very much enhanced ability to remember almost every item on the list. (Ref. 14.21)

Our unconscious mind is necessary in that, were we forced to pay conscious attention to all that was happening around us, we would be in a permanent state of distraction. We would be unable to put together even simple thoughts. Our ability to think, reason and create would be seriously jeopardized if we could not handle most incoming sensory data at the unconscious level. The unconscious component of our mind acts as a semi permeable membrane allowing passage of only relevant information that is necessary for survival or other important acts. It protects us from embarrassing or traumatic memories which are too harsh for us to deal with. (Ref. 14.22) Our unconscious mind allows us to develop special skills such as playing a musical instrument or driving a car, which become largely automatic as the skill is mastered. (Ref. 14.23)

The unconscious mind also governs all of the automatic body-function processes such as the operation of organ systems. If we were forced to consciously operate the thousands of enzyme and metabolic pathways, none of us would survive. (Ref. 14.24) The interplay of all of the chemical reactions which are constantly occurring synchronously within the body is so immensely complex that it vastly exceeds the powers of our consciousness. (Ref. 14.25)

Each organ system is continuously solving problems 24 hours per day for the entire life of the organism. They learned their jobs over hundreds of millions of years through evolution. The DNA molecule acquired and stored this information in a genetic memory bank during this long learning process. (Ref. 14.26) This unconscious memory process is part of our overall intelligence apparatus. It requires the acquisition and retention of an immense amount of information, plus an extremely complex and sophisticated form of communication.

Our consciousness has only very limited access to all of the body functions, including learned complex patterns such as the performance of a piano concerto. As we learn new material it is stored in that part of the brain which functions unconsciously. Erwin Schrodinger has defined the conscious portion of brain activity as that portion which deals with new experience. (Ref. 14.27)

Various external and internal stimuli as well as other mental activities appear to be conscious only when they are relatively new or unfamiliar. As they become familiar, habitual or automatic, they gradually fade from consciousness into the unconscious mind and contribute little if anything to our ongoing awareness. (Ref. 14.28)

Many more incoming stimuli are processed by the body than ever reach a level of consciousness. A distinction is required between the "registration" of stimuli and their "conscious perception." Registration denotes the general reception of all incoming stimuli by the nervous system, but conscious perception denotes the process whereby certain stimuli gain dominance over less immediately important stimuli and therefore enter into conscious awareness at the cortical level. (Ref. 14.29) The unconscious processing of incoming stimuli is automatic and much of it is

learned. As a child one may be acutely aware of a chirping cricket that might go completely unnoticed by an adult.

The unconscious perceptual apparatus of the human brain is not only capable of accurately understanding the meaning of information, but unconscious intelligence can also make logical, meaningful associations with relevant memories, and then activate precisely those brain nerve networks or mental processes that are appropriate to respond to what is perceived without any conscious awareness. The unconscious mind is very capable of making judgments with considerable efficiency. The unconscious can detect a reality, despite the lack of conscious awareness, and produce an appropriate behavioral response. (Ref. 14.30)

Every "gut feeling" or "intuition" experienced by a person is the result of the unconscious mind integrating stored memories and other information. Most of our choices, actions and behavior are the result of this automatic unconscious process. This allows our conscious mind to deal with new problems and previously unrecognized challenges. As we get older we gain a larger repertoire of automatic behavioral patterns requiring no conscious effort. Even very complex behavior patterns once learned become automatic, such as playing a complicated piano arrangement while carrying on a conversation with another person.

Every new idea or concept that we generate is the result of the unconscious mind in action as it integrates stored information and memories, the great majority of which are held secret from our consciousness. Our conscious mind can usually generate a logical rational reason for justifying whatever thoughts and behaviors the unconscious mind produces. The conscious mind can also override the unconscious mind, so that any behavior is ultimately under control of our consciousness thus allowing free agency to operate.

One difference between man and higher primates is the greater abundance of behavior ultimately under control of human consciousness. The chimpanzee to a certain extent also appears to have the capacity to make conscious choices, but not to the same degree as humankind.

(7) Consciousness, as well as unconsciousness, is continuing to evolve to higher states of increasing complexity as it relates to material existence.

Barbara Brown has speculated that the abilities of the unconscious mind have evolved over time and in the various animal species. (Ref. 14.31) They didn't just suddenly appear in humans. All of the physical mechanisms of survival and adaptation, including behavior patterns, cellular repair, and operation of the immune system have evolved and are continuously evolving as part of the unconscious. Most of the ongoing physical mechanisms, which are continuously functioning within the body, never reach our level of awareness. If they did, it would produce complete mental chaos.

In similar fashion, J.Z. Young has stated that if the human brain and behavior have evolved slowly over a prolonged period of time, then it seems likely that those features that seem to separate humans from animals have also been acquired gradually. It is most unlikely that human beings suddenly began to have consciousness without other animals having had incremental amounts before our evolutional appearance. (Ref. 14.32) The elevation of consciousness to its present level, as seen in humankind, required certain prerequisites, not the least of which include the power to make symbolic representation through language as well as the acquisition of vision. (Ref. 14.33)

It was indicated in a prior chapter that there is evidence human consciousness underwent an increase in degree during the second millennium B.C., as described by the psychologist Julian Jaynes of Princeton University. In opposition to Jaynes' conclusion that man's consciousness was basically non-existent prior to that time, there can be no question but that human consciousness existed long before 2000 B.C. Nevertheless, it would seem reasonable that he has at least identified a time in history when human consciousness did appear to increase.

As Jeremy Campbell has stated, "Archaeology is continually extending the history of human consciousness further back in time." (Ref. 14.34) Alexander Marshack has concluded that Neanderthal man had symbol systems which reflected a well-defined social structure and awareness of self and nature. (Ref. 14.35) Their carved figures and markings on caves dating back to about 30,000 B.C. demonstrate a complex system of interrelated images and abstract notations. They truly had a rather sophisticated form of communication and information storage. (Ref. 14.36)

There is also evidence of a continued increasing consciousness within humankind, which will be presented in the next two chapters.

(8) Consciousness is not restricted to humans, but is found in other animals as well. Some evidence has already been cited in support of this statement. The biggest question relative to consciousness that needs to be answered is whether or not it exists in non-life forms.

For the purpose of discussion I have arbitrarily divided intelligence and consciousness into organic and inorganic types. This, as

indicated earlier, is an artificial distinction, but allows us to explore both possibilities with greater clarity. Let us first finish dealing with organic consciousness, which is restricted to life forms.

Some evidence has already been cited which would suggest that consciousness is present in higher non-human primates as well as certain other mammals. In addition, Konrad Lorenz provides further insight into the proposed consciousness of certain mammals. He believes that some animal species have become "self-exploratory," which he sees as a new evolutionary step in cognition and awareness. This gives the animal an awareness of the self in relation to the surrounding universe. He believes the cat that grooms itself has an awareness of its own being, and monkeys grooming each other reveal an awareness of self as others see them. (Ref. 14.37)

Lyall Watson has given other examples of self-awareness in vertebrates, and points out that its presence requires both learning and memory and transcends space and time. It involves creation of mental images and models of the environment which include the subject. (Ref. 14.38)

There is most compelling evidence that consciousness is centered in some location other than the cerebral cortex, as based on a relatively recent discovery that many individuals with hydranencephaly have both relatively normal intelligence and consciousness. Hydranencephalic individuals have no cerebral cortex but can have apparently normal intelligence. One man in particular had a measured IQ of 126 and achieved a first-class honors degree in mathematics at Sheffield University. A CT scan demonstrated "virtually no brain." John Lorber of Sheffield University has studied hundreds of hydranencephalics with CT scans, many of whom had no significant loss of intelligence. He

found that half of those who have lost 95% of their cranium to fluid have IQs greater than 100. (Ref. 14.39) This gives undeniable evidence that the cerebral cortex is not nearly as vital to mental competence and consciousness as has been previously assumed. It also gives good support to the argument that many other animals have sufficient brain hardware to allow for the presence of consciousness.

Brain size in general does not correlate very closely with level of intelligence. Neanderthal man had a brain size of 1500 cubic centimeters, which is larger than the average brain of today, yet was probably not as intelligent. (Ref. 14.40) Even today there are geniuses with brain volumes which are smaller than average as well as larger-brained individuals who are of lesser intelligence.

Evidence continues to increase that consciousness is primarily centered in the brain, although the entire nervous system of the body appears to be a participant in the process of conscious awareness. (Ref. 14.41)

There is laboratory evidence which would even support the concept that the entire body is an instrument of consciousness. Other physiological systems besides the brain and nervous system are involved, and are more attuned to other aspects of awareness. (Ref. 14.42)

The recognition that there is a connection between various states of consciousness and variations in neurophysiological activity would support an expanded concept of awareness which contends that the entire organism is an expression of consciousness, and various components of an individual's total consciousness are located throughout the body. (Ref. 14.43) If so this would be additional

evidence to support the concept that other animals have consciousness also, albeit to a lesser degree. Jesuit paleontologist Teilhard de Chardin has even stated that, "Evolution is an ascent toward consciousness." (Ref. 14.44)

As one continues to study the processes of evolution, it becomes apparent there is evidence leading to the conclusion that probably there is some degree of consciousness on a planetary level in all organisms, unless of course one concludes that consciousness is a threshold phenomenon. (Ref. 14.45)

Gordon G. Globus, of the Department of Psychiatry at the University of California at Irvine, states that there is evidence of conscious activity as far down the scale of animal evolution as the metazoa. He finds indications of "selective attention" at these lower levels that foreshadows higher properties of consciousness. (Ref. 14.46) He believes that any apparent absurdity in the consideration of assigning consciousness to lower life forms may simply be a reflection of human chauvinism.

The bacterium when stimulated has a limited number of possible behavioral responses. As the evolutionary ladder is climbed, the number of possible responses increases based on the level of complexity of the organism. Itzhak Bentov sees in nature a spectrum of realities based on the complexity of the organism. (Ref. 14.47) There are no sharply defined boundaries for each organism's level of consciousness or its reality, but rather there is a continuum similar to the electromagnetic spectrum. He believes all matter in the universe, as it becomes constructed in increasingly complex forms, is moving up in levels of consciousness under the forces of evolution. Present-day nervous systems are capable of interacting with nature in more complex patterns that allow consciousness to increase. (Ref. 14.48) He has stated, "Matter, being made of quanta of

energy, is the vibrating, changing component of pure consciousness." (Ref. 14.49)

I now have no lingering doubt that much of organic life, if not all, has both intelligence and consciousness of varying degrees. By this I am not suggesting that a chimpanzee will lounge under a shade tree and contemplate the existence or absence of a creator, but rather there now seems to be nearly irrefutable evidence that they are aware of their own existence and differentiate self from non-self. Other higher mammals also appear to manifest intelligence and consciousness. Although consciousness may be a threshold phenomenon, it very well might extend down the entire spectrum of life forms to even the simplest of organisms. It is conceivable that an amoeba may be aware of its immediate surrounding environment, even though not much more.

Although consciousness appears to be an attribute of higher non-human life forms, and perhaps all life forms, I am less ready to accept the idea that non-life forms or inorganic intelligence possess consciousness, although there are eminent individuals who believe that they do, and not without some justification. The acceptance of this belief does go a long way toward making sense out of certain facets of our existence which otherwise have no valid explanation. For one thing, it avoids the issue of the origin of consciousness since it might be assumed that consciousness has always existed in one form or other.

There are now an increasing number of scientists who believe that inorganic matter, and indeed all matter, contains varying degrees of consciousness. Itzhak Bentov believes that consciousness is an attribute of all matter beginning at the subatomic level and continuing all the way up the scale to the macroscopic universe. He would define consciousness as the capacity of any system to

respond to stimuli. An atom can be stimulated by applying ultraviolet light. The atom's types of responses are quite limited, but it could bump an electron into a higher orbit. (Ref. 14.50)

There are others as well, like Arthur M. Young, who would postulate that consciousness is a continuum linking material, biological and psychological entities. He proposes that atomic and molecular organization are protoconscious and provide the basis for more complex expressions of awareness. Such properties gradually develop and foreshadow the characteristics of human consciousness, in much the same way as the intrauterine embryo anticipates the adult of the species. He states that the difference between human awareness and that of other living organisms, and of inorganic matter, may represent discrete steps in the evolution of consciousness. Therefore, processes within an animal's body exemplify a level of consciousness more complex than that of the plants upon which it feeds, which are in turn more complex than the earth out of which the plants grow. He proposes a seven-stage process by which consciousness evolves, from its prototypical manifestations in the photon through nuclear particles, atoms, molecules, plants, animals, and then man. (Ref. 14.51)

Physicist Eugene Wigner and others have argued that the inclusion of consciousness may be an essential ingredient in any future theories of matter. (Ref. 14.52)

9) Every system whether living or non-living has stored information as memories. Every system is continually storing new information. The more complex the system, the greater amount of information it contains. The vast majority of stored information, even in humans, is unavailable during an ordinary state of consciousness. Stored information or memories become more available during higher states of consciousness. Although most

memories are hidden from view, being stored in the unconscious, there are still many which are retrievable and can be brought to a conscious level. A great deal of stored information is inherited and is programmed into the DNA molecule. There is a great amount of information which is also gained or learned during life which is mostly stored in the unconscious. Much of the stored information within any organism directs the automatic body functions such as respiration, food and energy assimilation and excretion, as well as operation of the immune system and other processes.

The stored memories in humans that are retrievable during an ordinary state of consciousness represent a relatively small fraction of the total present. The ease with which any memory can be brought to consciousness would seem to have a great deal to do with the level of intensity of any accompanying emotion experienced at the time the memory was imprinted. The stronger the feeling of emotion experienced with any memory event, the greater the intensity of the memory-encoding process. The more strongly that any memory is imprinted, the more easily retrievable to consciousness it is. Most of our memories are not retrievable during an ordinary state of consciousness because the level of emotion experienced during the imprinting process was not intense enough. This concept is an oversimplification to the extent that some memories that were encoded during a very traumatic experience have been selectively hidden from consciousness.

It would also appear that memories achieved during a particular state of consciousness are generally available only during that particular state and are very difficult, it not impossible, to retrieve in other states. This phenomenon has been referred to as "state-bound consciousness." It has been experimentally determined that information acquired while drunk can better be remembered when drunk than when sober. It is also clearly apparent that information

gained, or wisdom achieved, during higher states of consciousness transcends ordinary awareness and is mostly lost during the ordinary state of consciousness. (Ref. 14.53)

The process of encoding memories as it relates to the experiencing of feelings is an example of the mind-body connection. This connection is further illustrated by Elmer E. Green, a psychophysiologist. He maintains that every change in the physiological state of an individual is accompanied by a change in the mental-emotional state, both conscious and unconscious, and conversely every change in the mental-emotional state, either conscious or unconscious, is accompanied by a change in the physiological state. (Ref. 14.54) This again is a manifestation of the close integration of mind and body.

(10) There is evidence mounting from different scientific disciplines which would strongly indicate that will is one of the properties of consciousness. Although there are those individuals who would argue that the perception of will is an illusion, I believe that will is an essential ingredient of consciousness.

The exertion of will appears to transcend the normal habitual parameters of human functioning. Much of human behavior can be accounted for by unconscious choices, genetic programming, and environmental conditioning. However, it is a simplistic view of all behavior that excludes purposive volition. Any exclusion of will does not appear valid, according to both empirical observation as well as phenomenological experience. (Ref. 14.55)

Sir John Eccles in his book Neurophysiological Basis of Mind states that it is a psychological fact that we can control or modify our actions by exercising "will." He stimulated the motor cortex in

patients undergoing brain surgery while they were conscious, and evoked complex motor acts. The patients reported that the experience was quite different from that which occurs during a "willed" movement. The experience of having "willed" the action was missing. (Ref. 14.56)

Roger Sperry proposes that consciousness is an emergent property of the brain which has evolved from interactions of the simpler elements, and that the properties of the brain have capacities that are greater than the sum of the capacities of the parts involved. (Ref. 14.57) There is a mutual interaction between mental and neural events, and mind moves matter in the brain. (Ref. 14.58)

Wilder Penfield, a neurophysiologist, in his book The Mystery of the Mind, states that, "There is no good evidence...that the brain alone can carry out the work the mind does." (Ref. 14.59) Barbara Brown also draws the inescapable conclusion that the mind possesses an ability to regulate and control its own source, the brain. (Ref. 14.60)

Evan Harris Walker, a quantum physicist at NASA Electronics Research Center in Cambridge, Massachusetts, purports to demonstrate the mathematical relationships between the quantum events in the brain at the level of the synaptic junction, and conscious perception. (Ref. 14.61) His theory is expressed in complex mathematics not easily described in verbal metaphors; however, his major conclusions can be stated as follows:

(a) Consciousness is both real and non-physical.

(b) Consciousness is coupled to the physical brain by quantum mechanical wave function.

(c) The brain employs physical processes for some of its data management that can be described in terms of quantum physics.

(d) Events in the brain are governed by a higher-order or "hidden variable" which is synonymous with consciousness. (Ref. 14.62) The latter concept would at least in part refer to will.

There is no longer any question in my mind that both my unconsciousness and consciousness largely control the actions of my own body. I have the ability to will certain actions that my body then performs. There are unquestionably many physical constraints placed upon me limiting this process. I do not agree with those who have suggested that the conscious act of will is illusionary. I believe that the act of will represents one example of intelligence controlling the movement of matter and the expenditure of energy. In reciprocal fashion it again needs to be stated that matter-energy is continually perturbing intelligence, thus influencing the direction and rate of speed at which it operates. It would appear that the sciences of both mind and matter are turning from the atomistic reductionism of Aristotle toward the holistic integrated insertions of Plato. (Ref. 14.63)

(11) In conjunction with will, another attribute of consciousness of similar nature is the principle of free agency. The great majority of body processes are occurring unconsciously, including much of our behavior, so that our bodies are largely functioning on automatic pilot. However, we do perform many acts that are the direct result of conscious thought, which requires a decision-making process. There is good evidence that higher non-human primates share this attribute, albeit to a lesser extent.

Even though free agency is an attribute of consciousness, there is experimental evidence indicating that every conscious decision and act is preceded by an unconscious process. Benjamin Libet, of the University of California at San Francisco, has demonstrated that there is a specific pattern of electrical activity (readiness potential) in the brain that precedes not only simple voluntary actions such as moving a finger, but also the awareness of the intention to move. He contends that the unconscious mind initiates all voluntary acts by feeding various alternatives to the conscious mind which then selects a course of action. This still leaves room for the expression of free agency, since the conscious mind makes the final decision as to whether an act is performed or not. He indicates that there is approximately a quarter of a second between conscious awareness of an impending action and its actual occurrence, which is time enough to either permit or cancel the intention. (Ref. 14.64)

Sir John Eccles, a Nobel prize-winning psychobiologist, believes however that the readiness potential in the brain is rather the consequence of a voluntary command or act of will. The gradual build-up of the readiness potential is widespread and not localized to any one part of the brain. (Ref. 14.65)

The Nobel prize-winning neurophysiologist Roger Sperry has also concluded that mind or consciousness controls all brain processes. Brain cells obey a higher command involving feelings, wants, choices, reasoning, and moral values. (Ref. 14.66)

All of one's choices, both conscious and unconscious, are influenced by the sum total interaction of all forces in operation, both physical and mental. These forces would include physical or biological drives, such as the need for food, shelter, sex, etc., as well as the higher needs of love, acceptance, the seeking of

pleasure and the satisfying of all emotional needs, and the avoidance of pain. Other forces which influence our behavior would include the four or more physical forces. Any individual composite behavior is continuously being influenced by any and all forces operating in nature.

As stated before, most all animal behavior and much of human behavior is the result of unconscious brain processes requiring no thought or act of will. Behavior reflects the constant interaction of emotions, drives, instincts, needs and other processes.

Most behavioral traits are instinctual and require no conscious effort on the part of the organism. These behavioral traits are genetically programmed and passed from one generation to the next. Less complex organisms will display more instinctive behavior and more complex organisms will display proportionately more behavior that is the result of consciously active thought processes. Even though humans are less robot-like than more simple life forms, we still have many wired-in behaviors. The difference is primarily in ratio only. (Ref. 14.67)

Some behavioral traits can be chemically transmitted from one animal to another. For example, James McConnell found that he could train a planarian flatworm to respond to a flashing light, causing it to contract its body. If he then ground trained planarians into pablum which could be fed to other untrained planarians, the organisms would display the same type of body contracting behavior as the previously conditioned planarians, outperforming the control group. Although the results of this experiment were initially met with considerable skepticism, there have since been many similar studies performed on rats. Well over one hundred

experiments have been reported in the literature claiming positive success in the biochemical transfer of behavior from one organism to another. (Ref. 14.68)

Mice can be made to avoid darkness, as another example of biochemical behavior modification. Georges Ungar taught a group of mice to avoid the dark by conditioning them with electric shocks. By then making a brain extract from these conditioned mice and injecting it into a group of unconditioned mice, he found that he could transfer the dark avoidance behavior to them as well. (Ref. 14.69)

There is no question that certain chemical agents can modify feelings and/or behavior in all animals including humans. This is best exemplified by the use of mood-altering drugs. Chemically induced or transferred behavior would appear to be the result of producing an exaggeration of pre-existing behavioral programs that are not ordinarily triggered under normal circumstances. The programs have been either genetically encoded or learned by the organism, which in turn can be stimulated by the proper chemical agent. The pattern might lie dormant for the entire life of the organism, and only be elicited if the proper chemical trigger is introduced. An example of such behavior might be the sudden rage experienced by an otherwise sedate individual, leading to a violent act such as mass murder. The last scenario is not meant to imply that human behavior is entirely the result of genetic programming or chemical stimulation, although much of it undoubtedly is. Many unconscious processes are occurring within the human brain, and they ultimately feed various choices to our conscious mind, which in turn sorts through the alternatives, and then by exercising free

agency chooses one to follow.

(12) Consciousness as a property of intelligence is also space-related. As such, this potentially allows for the occurrence of certain phenomena that are yet to be scientifically validated, including such things as ESP, OBEs, and other psychic events. This in no way indicates that psychic phenomena necessarily occur, but it does allow for their possible existence.

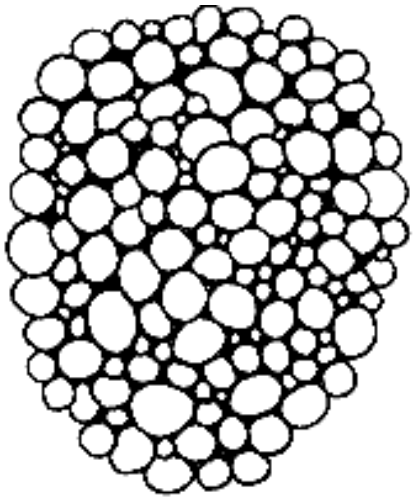
In our present state, mind is very much dependent upon the operation of the brain, and it has been stated that mind is what the brain does. The mind reflects the process of the brain, is time-related and is continuously evolving. The mind also contains a vast quantity of stored information, most of which is located within unconscious memory, but a small proportion of which is accessible to one's ordinary state of consciousness.

This information is stored in space and is associated with a specific and precise arrangement of molecules, atoms and subatomic particles. Our brains and bodies are examples of complex information storage systems where atomic particles are semi-rigidly fixed in a relatively firm spatial distribution. It is not yet certain whether the stored information is confined to non-material space, occupies the matter located within space, or is contained within both. Nevertheless, the storage of information unquestionably requires space. Continually increasing states of ordinary consciousness require an increasingly larger volume of space as a prerequisite. It is my contention that because the volume of space within the universe is increasing exponentially over time, so also are intelligence and consciousness.

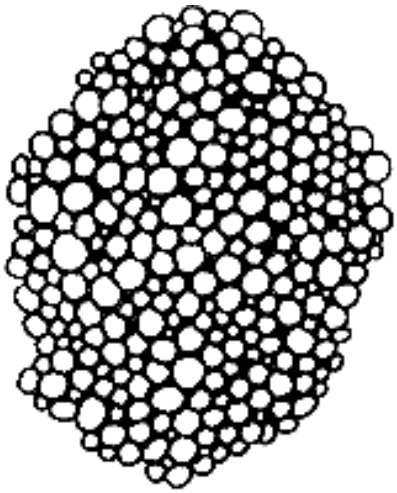
There is considerable evidence which suggests that information is stored holographically in space. Each memory stored would appear to be placed into the most promising position for retention, analysis, and logical processing relative to all other previously stored memories. Each memory would appear to be distributed in space over a much larger volume than can be accounted for by specific patterns of a few molecules or cells within the brain. As new memories and associations are acquired, there are specific changes occurring within the brain that reflect this process. New dendrites with new synapses are constantly being formed between neurons as the old ones break down. The physical structure of the brain with its very precise spatial relationship of molecules is constantly changing over time as new memories are recorded. It would seem probable that the following mathematical expression is valid:

Consciousness Potential $\propto$ (number of synapses/neuron) (total number of potential neurons in brain)

One might postulate metaphorically that the storage of information within space might be somewhat foam-like in its distribution. There is evidence on a macroscopic level that galaxies are spatially oriented in such a way that, cumulatively, they form a foam-like pattern. This could as well be extrapolated in a microscopic direction, where space itself has been described as possibly being foam-like in quality. The more information that is compacted into a confined volume of space, the smaller, less coarse and finely dispersed the foam appears. Less information contained within a specific volume of space would have a more coarse, foam-like distribution.



less information stored
(lesser information density)



more information stored
(greater information density)

This metaphorical representation of information storage is useful in that it allows us to begin developing a variety of mathematical relationships that potentially exist, thus relating consciousness to the rest of the our maternal existence. The following relationships would seem quite probable.

(a) Level of consciousness should be directly proportional to the volume of space that contains an autonomous concentration of information. Larger brains in general reflect greater information storage and potentially allow for a higher level of consciousness. A larger brain mass per se does not automatically assure greater consciousness, because of other variables that contribute to consciousness level.

(b) Level of consciousness should be directly proportional to the density information. The greater the amount of information (memories) of stored per unit-volume of space, the greater the potential level of consciousness that an organism might achieve. This would be metaphorically reflected by a more finely dispersed foam-like distribution of information. In comparing an infant brain to that of an adult, the latter has a

much greater quantity of stored information (memories) even though the physical brain size is only a little larger.

The concept that memory is stored in space rather than within the hard-wiring of the brain would also be in agreement with Rupert Sheldrake's theory of morphic resonance. Morphogenetic fields require space-time to operate and exert their influence. The more space that is available, the greater the number of fields that are potentially possible. As space expands exponentially, the number of fields that could potentially form increases in number exponentially. It is very conceivable, but still yet to be established, that intelligence-consciousness exerts its controlling influence through the presence of fields much like Sheldrake envisions. The number of fields possible and their level of complexity in the early universe would have been far fewer, and more simple, than presently found in the universe of today.

The same generalization could be applied to Jung's collective unconscious, which also requires the presence of space. The more space available, the greater the potential for the existence of a collective unconsciousness.

This concept would also be consistent with Sheldrake's hypothesis of formative causation, which proposes that memory is inherent in nature. (Ref. 14.70) He suggests that natural systems, such as termite colonies, pigeons, orchid plants, or insulin molecules, inherit a collective memory from all previous things of their kind, however far away they were and however long ago they existed. Because of this cumulative memory through repetition, the nature of things becomes increasingly habitual. They are as they are because they were as they were. (Ref. 14.71)

Sheldrake also proposes that our own memories may not be stored inside our brains, as we have traditionally assumed, but in morphogenetic fields that exist in space. These fields shape all the different kinds of atoms, molecules, crystals, living organisms, societies, customs, and habits of mind. (Ref. 14.72)

Morphogenetic fields are non-material regions of influence extending in space and continuing in time. They surround the systems they organize and are localized within them. When the system that is organized disappears (dies), its influencing effect remains and can appear once again in another time and place whenever physical conditions are appropriate.

Sheldrake has suggested that, "Because all past members of a species influence these fields, their influence is cumulative: it increases as the total number of members of the species grows." (Ref. 14.73) He further suggests the possibility that the physical laws we describe in physics are not so much laws, but more like habits impregnated in morphogenetic fields. These laws or habits may have actually evolved with nature itself and are even still evolving. (Ref. 14.74)

Just as everyone in existence has different levels and types of intelligence, so does everyone have different levels of ordinary consciousness. Within certain limits there is a continuous spectrum of human consciousness, with no one individual consciousness being exactly like any other. Any individual's level of consciousness is also continually varying over a 24-hour time period, such as during sleep, slumber, alert wakefulness, drunkenness, etc. What each person experiences during the ordinary consciousness state is unique, just as each of us has a different and unique perception of reality. Some minds would appear to be more visual, while others are more auditory. The

conscious experience of a Down's, savant, or autistic person certainly must be different from that of an Einstein.

The following formulas are postulated based on the concepts discussed above. They are not yet considered to be complete, but do represent a beginning. They also begin to demonstrate how consciousness interrelates with space, time, matter and energy.

(1) $\mathbf{AC = (RP)(K_1)}$

(2) $\mathbf{TI = (V)(D)}$

(3) $\mathbf{TI = (RS)(T)}$

(4) $\mathbf{RP = (LR)(SM)(K_2) / BD}$

(5) $\mathbf{PE = (TI)(LR)(IF)(SM)(DL)(K_2)}$

AC = Actual level of consciousness being experienced at any moment in time.

BD = Brain dysfunction (loss of brain integrity secondary to any pathological process such as stroke, Alzheimer's, alcoholism, and encephalitis, all of which result in a decreased ability to process information).

D = Density of information (number of units of information stored per unit-volume of space).

DL = Distress level prior to P.E.

IF = Intensity of focusing of attention.

K_1, K_2, K_3 = other influencing factors yet to be discovered.

LR = level of relaxation of body musculature.

PE = highest level of consciousness potentially achievable (peak experience).

RP = rate of information processing (number of units of information, both conscious and unconscious, being processed by the mind per unit of time).

RS = rate of information storage (number of units of information stored per unit of time).

SM = level of effectiveness in stilling the mind.

T = total duration of time over which entire quantity of information was stored.

TI = total quantity of information accessible to mind, which includes all that is both conscious and unconscious.

V = volume of space that the total quantity of stored information is contained within.

There are undoubtedly other properties of consciousness which will be better identified as more knowledge accumulates. Some additional properties will be discussed as we begin to examine altered states of consciousness.

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Chapter 15

Altered States of Consciousness

(13) Human consciousness is most often experienced in an ordinary state. However, it can occur at times in a variety of altered states.

William James wrote in 1929, "Our normal waking consciousness...is but one special type of consciousness, whilst all about it, parted from it by the filmiest of screens, there lie potential forms of consciousness entirely different. We may go through life without suspecting their existence; but apply the requisite stimulus, and at a touch they are there in their completeness, definite types of mentality which probably somewhere have their field of application and adaptation. No account of the universe in its totality can be final which leaves these other forms of consciousness quite disregarded...." (Ref. 15.1)

There are different states of consciousness that anyone might experience during their lifetime, some of which are common and others that are not. Some states virtually everyone has experienced, such as drowsiness prior to sleep, dreams, or perhaps inebriation.

Charles Tart has studied altered states of consciousness rather extensively. He maintains that there are a variety of ways to produce altered states of consciousness, which he places into two broad categories: (1) Reduced exteroceptive stimulation and/or motor activity; and (2) Increased exteroceptive stimulation and/or motor activity and/or emotion.

In the first category he includes absolute reduction of sensory input, constant exposure to repetitive monotonous stimulation, and a drastic reduction of motor activity. He gives several specific examples, some of which include solitary confinement, prolonged social and stimulus deprivation while at sea, "break-off" phenomena in high altitude jet

pilots, extreme boredom, hypnogogic and hypnopompic states, dreaming, somnambulism, experimental sensory deprivation, and profound immobilization in a body cast.

In the second category he includes excitatory mental states resulting primarily from sensory overload, as sometimes accompanied by strenuous physical activity. He indicates that profound emotional arousal and mental fatigue may be contributing factors. Specific examples listed include brainwashing, third-degree grilling tactics, religious conversion, healing trance experiences, certain religious rites, states of inner emotional turbulence, traumatic neuroses and several others. (Ref. 15.2) In addition to those mentioned in this category, one would also have to list the near-death experience.

Laski in 1961 reported other activities that may be associated with altered states, including childbirth, viewing landscapes, listening to music, and having sexual intercourse. (Ref. 15.3)

Additional ways of achieving altered states have been given by others, including sleep deprivation, fasting, breath control, the use of psychedelics and various meditative disciplines. These all elicit biochemical changes within the brain that apparently unlock the door to unconscious levels of mind. (Ref. 15.4)

Tart, like others, describes some of the characteristic features of altered states of consciousness, many of which overlap Maslow's criteria of a peak experience mentioned in Chapter One. Tart would include the following:

> (1) There is disturbed time-sense with either an acceleration or slowing of time. There may be a subjective feeling of timelessness with time coming to a standstill. This is a transient experience and is not sustained indefinitely.
>
> (2) There is occasionally, but not always, a loss of control in the paranoid experience of fear, or the loss of grip on reality along

with the feeling of helplessness. These are absent in a peak experience.

(3) There is a change in emotional expression that may reach an extreme in either direction, from ecstasy to profound fear and depression. The feeling of overflowing joy, infinite love, blessedness and peace are common. The peacefulness experienced passes all understanding and defies description. There is the conviction that ultimately there is no ground for anxiety. There is a feeling of unspeakable awe, inexpressible gratitude and boundless devotion. (Ref. 15.5)

(4) There can be body image changes, including a profound sense of depersonalization, distortion in size of body parts, expansion of consciousness, a division between body and mind, and dissolution of boundaries between self and others or the world or universe. Some have described this as a feeling of unity with all elements, a knowing or understanding of the essence of life, and a total lack of physical sensation. It is completely different from ordinary human experience. There is a fusion of self with the universe, so that the observer and what is observed seem to be the same. (Ref. 15.6)

(5) There can be perceptual distortions such as hallucinations, increased visual imagery, hyperacuteness of body senses, and illusions of every variety. Colors grow richer and deeper.

(6) There is a change in meaning or significance, including feelings of intense, profound, vivid insight; and truth discovery that may or may not bear a relationship to the objective truth or actual reality. (Ref. 15.7) There is the perception of absolute certainty that the newly acquired knowledge or experience is truly or ultimately real, in contrast to the feeling that the experience is a subjective delusion. (Ref. 15.8) There have been numerous instances of sudden illumination, creative insights and problem-solving which have occurred during states of altered

consciousness. [Ref. 15.9] Such experience is in fact the basis of this book.

(7) There is the inability to find appropriate words to communicate the experience, and the feeling of intense realness to another person. The experience is ineffable. Revelations may also be too complex to be verbalized, such as the gaining of insight into the significance and interrelationships of many dimensions of life. One becomes aware of many levels of meaning simultaneously, and briefly understands the totality of existence. The question of whether such insight is actual or simply an illusion remains unanswered. [Ref. 15.10] I offer the Integrated Theory of Intelligence as a test of this question. If in time the concepts put forth in the theory, which originated from a peak experience, are determined to be valid, then this, I believe, is strong evidence supporting the hypothesis that accurate new insights can be obtained in this manner that are not illusionary.

(8) The experience results in a positive change in attitude and behavior relative to oneself, others and life. There is an increased personality integration, including a heightened sense of personal worth. One has an increased faith in their own potential for creative achievement. There is greater compassion, sensitivity and tolerance felt in one's relationships with other persons. There is a loss of the fear of death and an enriched appreciation for the whole of creation. [Ref. 15.11]

Tart's description of altered states of consciousness is more general than Maslow's, which deals specifically with peak experience. The latter refers to a very specific kind of altered state, and next to the near-death experience it is the most profound type. A synopsis of the peak experience was presented in the preface. Maslow believed that mystical, religious or transcendental experiences were all varieties of peak experience. [Ref. 15.12]

The peak experience leads to a substantial change in the life of anyone who has had one, relative both to attitudes and behavior. One learns that life is a process, and the prior distinctions between winning and losing, success and failure, become much less important. (Ref. 15.13) The individual begins to trust intuition much more. Their inner signals become stronger. One feels as if he or she is cooperating with events, rather than controlling them or suffering them, by aligning themselves with existing forces. (Ref. 15.14) There is a transformation of fear so that virtually any ill event can be accepted. There is no longer a fear of failure, because of the realization that we are engaged in a continuous learning process. One is no longer intimidated by pain or paradox. Each survival and transcendence adds courage for every new encounter. (Ref. 15.15)

The intensity of the peak experience appears to have a more profound effect than does the content of the experience, as far as each is related to subsequent change in values, personality and conduct, either positive or negative. Painful experiences appear to be as personally revealing and permanently beneficial as experiences of great joy and beauty. (Ref. 15.16)

It has been determined that the incidence of peak experience is surprisingly common. Andrew Greeley and William McReady, of the University of Chicago, conducted a survey of the U.S. population in 1975 and determined that 40% reported they had had a mystical or peak experience during their lifetime. (Ref. 15.17)

The near-death experience is the other very profound form of altered state of consciousness, probably the more profound of the two. It is very similar in most respects to the peak experience as defined by Abraham Maslow. A controlled study of near-death or "core experience," as reported by Kenneth Ring, lists various elements that were common to many individuals interviewed. The core elements reported by Ring, which are similar to those of the peak experience, include feelings of profound peace, well-being, joy or euphoria; loss of bodily sensation; absence of pain; feeling of separation from the physical body, often

floating through a soft black void; the taking stock of one's life in a completely guilt-free environment; loss of time-sense; the feeling of total acceptance, warmth, love and security; a total and complete inability to find words which can convey the quality of the experience; and a permanent and profound effect which changes one's life. (Ref. 15.18) Images are also seen in a holographic domain, with the observer being a part of the process. About the only major differences between near-death and peak experiences are that in peak experience there is the lack of perception of dying or death, the lack of perception of traveling through a tunnel toward a bright light, and the lack of rapid visual playback of a life review.

Many astronauts have experienced altered states of consciousness during prolonged space flight under conditions of zero gravity. Their experiences, as they describe them, sound very much like a transcendent state or peak experience. (Ref. 15.19)

Theodore X. Barber, who is an authority on hypnosis and altered states of consciousness, has found a group of people who live in an altered state all of the time. He refers to this group of natural visionaries as FPPs (fantasy-prone personalities). They comprise about four percent of the population and are mostly female. They are in a state of consciousness that others must use hypnosis, yoga, meditation or drugs to achieve. They are vivid dreamers and are extremely hypnotizable. (Ref. 15.20) The FPP experiences clairvoyant dreams, precognitions, past life regressions, psychic healings, out-of-body experiences and other paranormal adventures. Barber has not concluded yet whether these experiences are pure fantasy or whether these people are perceiving other realities. (Ref. 15.21) None of these psychic experiences have yet been validated by science.

While some altered states of consciousness are clearly pathological, others are quite the opposite, and these latter provide valuable insights

into the nature of self and society. (Ref. 15.22) Barbara Brown has indicated that the benefits which can be derived would include the perfection of performance, increased body awareness and creative flashes of insight. (Ref. 15.23)

Stanislav Grof, psychiatrist and scientist, has also categorized various types of transpersonal experiences that he generally defines as the "experiential expansion or extension of consciousness beyond the usual boundaries of the body-ego and beyond the limitations of time and space." He also introduces two new terms, hylotropic and holotropic modes of consciousness.

Hylotropic consciousness is the normal, everyday ordinary state that is matter-oriented. We experience only a limited segment of the phenomenal world or consensus reality from one moment to another, which is based on perceptions derived through sensory organs. It has resulted in our Newtonian understanding of space and time.

Holotropic consciousness refers to non-ordinary states that mediate access to all other aspects of existence, and includes meditative, mystical or psychedelic experiences. Specific examples include the reliving of infantile or childhood experiences; biological birth; fetal development; conception; and ancestral, karmic and phylogenetic history. This requires the transcendence of linear time and space. (Ref. 15.24)

Grof identifies the major types of transpersonal experiences to include the following. (Ref. 15.25)

I. Transcendence of Spatial Boundaries, which suggests that boundaries between the individual and the rest of the universe are not absolute and include the following examples:

(a) Experience of Dual Unity, characterized by the loosening and melting of boundaries of the body ego, along with the sense of merging with another person into a state of unity and oneness. This would include but not be limited to a sense of fusion with a sexual partner.

(b) Identification With Other Persons, during which one has the perception of taking on the body image, physical sensations, emotions, attitudes, memories and mannerisms of another individual from the past or present.

(c) Group Identification and Group Consciousness, during which the subject has a sense of becoming an entire group of people who share some racial, cultural, national or other ideological characteristics.

(d) Identification With Plants and Botanical Processes, during which the individual has a convinced sense of being a particular plant, parts of plants or the physiological and biochemical processes in them at a cellular or molecular level.

(e) Oneness With Life and All Creation, during which one's consciousness expands to encompass the totality of life on this planet including all of humanity as well as all other life forms.

(f) Experience of Inanimate Matter and Inorganic Processes, which include the experiential identification with macroscopic and microscopic phenomena. One perceives what it would be like to be a river, ocean, fire, earthquake, quartz crystal, chemical element, molecule, electromagnetic force, or any other physical process.

(g) Planetary Consciousness, during which a subject's consciousness expands to encompass all living as well as non-living aspects of the planet, such as geological, biological, psychological, cultural and technological phenomena. This would correspond to the experiential counterpart of the Gaia hypothesis.

(h) Extraterrestrial Experiences, where one's consciousness extends to celestial bodies, other parts of the universe and astronomical processes beyond our planet. This can range from witnessing various events to actually experiencing what it feels like to be a star, supernova or pass through a black hole.

(i) Identification With the Entire Physical Universe, during which one has a complete and total simultaneous experience of everything there is. One has a sense of cosmic or divine consciousness.

(j) Various psychic phenomena, including out-of-body experiences, astral projection, clairvoyance, telepathy, etc.

II. Transcendence of the Boundaries of Linear Time

(a) Embryonal and Fetal Experiences, during which one experiences an intrauterine existence as well as various emotional experiences of the mother. This can extend back to cellular memory of the germinal cells and of conception.

(b) Ancestral Experiences, during which one regresses along biological lines to achieve a full experiential identification with an

ancestor, including body image, emotions, thought processes and memories.

(c) Racial and Collective Experiences, which involve the experiential phenomenon of being a larger group, and through it gaining detailed insights concerning social structure, religious practices, morals, history and technologies of the culture.

(d) Past Incarnation Experiences, that resemble ancestral, racial and collective experiences; which, however, are usually more dramatic, being associated with an intense emotional charge of either positive or negative quality. The essential experiential characteristic is a convinced sense of remembering an event that happened to an individual consciousness in a previous life.

(e) Phylogenetic Experiences, that are closely related to animal identification, sharing with it the sense of total anatomical, physiological, psychological and biochemical identity with other species of living organisms. They differ since there is a convinced sense of regression of historical time. One identifies with the members of prior species in the evolutionary history of life.

(f) Experiences of Planetary Evolution, where one witnesses panoramic images of the evolution of the entire planet, including its origins. This can be done as an observer, or the subject can experientially identify with the occurrence.

(g) Cosmogenetic Experiences, which are similar to the last category except that the subject witnesses or identifies experientially with the birth and development of the entire universe. Certain subjects, including physicists and mathematicians, have reported remarkable experiential insights into

problems related to astrophysics that can be expressed mathematically but cannot be fully intuited in the ordinary state of consciousness. Insights reported included Einstein's concept of an infinite but self-enclosed universe; non-Euclidean geometries; Minkowski's space-time; the "event horizon"; and the collapse of time, space, and natural laws in a black hole.

(h) Various psychic phenomena, including precognition, clairvoyance and clairaudience of past and future events; psychometry; and time travels.

III. Physical Introversion and Narrowing of Consciousness: Organ, Tissue and Cellular Consciousness. During these transpersonal experiences, the subject enters various parts of their body and witnesses or experientially identifies with the activities which are occurring within specific organs, tissues, cells or sub cellular structures.

Grof also characterizes other types of transpersonal experiences which have in common the experiential extension beyond consensus reality and space-time. He lists such phenomena as apparitions of and communication with deceased people, or experiences of the chakras, auras, meridians, and other subtle energetic manifestations.

He reports many incidents where individuals who have no particular knowledge of ancient myths or Eastern religious concepts have experiences, and have gained insights, into phenomena which have been included as traditions for thousands of years within ancient cultures and esoteric systems. (Ref. 15.26) These occurrences would suggest that individuals appear to have experiential access to mythological themes of all times and all cultures, and quite clearly support Carl Jung's concept of the collective unconscious and archetypes. (Ref. 15.27)

Grof states,

> The reports of subjects who have experienced episodes of embryonal existence, the moment of conception, and elements of cellular, tissue and organ consciousness abound in medically accurate insights into the anatomical, physiological and biochemical aspects of the processes involved. Similarly, ancestral experiences, racial and collective memories in the Jungian sense, and past incarnation memories frequently bring specific details about architecture, costumes, weapons, art, social structure and religious practices of the cultures and periods involved, or even concrete historical events. Subjects who experienced phylogenetic sequences or identification with existing lifeforms not only found them unusually convincing and authentic, but also acquired, in the process, extraordinary insights concerning animal psychology, ethology, specific habits or unusual reproductive cycles.
>
> ...Those individuals who experience episodes of conscious identification with plants or parts of plants occasionally report remarkable insights into such botanical processes as germination of seeds, photosynthesis in the leaves, the role of auxins in plant growth, the exchange of water and minerals in the root system, or pollination. Equally common is a convinced sense of conscious identification with inanimate matter or inorganic processes--the water in the ocean, fire, lightning, volcanic activity, tornadoes, gold, diamond, granite, and even stars, galaxies, atoms, and molecules. Even these experiences sometimes can mediate accurate information about various aspects of nature. (Ref. 15.28)

Any individual who has never had a transpersonal experience would justifiably be very skeptical about their reality. One would likely pass them off as illusions or hallucinations. However, those individuals who have had a transpersonal experience would indicate that it was not only

very real, but more intense and valid than their ordinary state of consciousness. They would all share a convinced sense of the happening. Therefore the questions must legitimately be asked: Is there any truth or validity to these experiences? Does one actually tap into a higher hierarchy of shared consciousness?

The implication would seem quite clear that all experiences had by any organism, no matter how simple or complex, are potentially experientially available to any of us in supraconsciousness states. Each of us either contains this information or has access to it within a holographic universal system. Another implication which seems to be even more incredible is that inorganic systems may also share some type of experiential existence and form of consciousness.

These concepts are very difficult for science to deal with and evaluate. Because of the rigid criteria that the scientific method demands, utilizing controlled experimentation, this offers a tremendous challenge to those who think of themselves as scientists to become involved in the evaluation of this data. It would seem that the only ways that the truth or falsehood of transpersonal experience might conceivably be determined is on the basis of the overall consistency or inconsistency in reporting by those individuals who have had the experiences; and by evaluating any insights or predictions made, which were previously unknown, that can later be verified as valid. Those having transpersonal experiences typically are convinced that they have access to new information which pertains to the universe that extends from the microcosm to the macrocosm. This should be testable, just as the Integrated Theory of Intelligence is being given as a test of the validity of peak experience.

Grof has developed his technique of holotropic therapy, which parallels the same achievements of psychedelic therapy, but without the same risks involved in the usage of drugs. The main contribution of holotropic therapy is the recognition of the healing, transformative and

evolutionary potential of non-ordinary states of consciousness. (Ref. 15.29) He combines the use of hyperventilation with relaxation, meditation and background music to achieve a supraconsciousness state while under close observation by a trained therapist.

Transpersonal experiences, whether induced by holotropic therapy or psychedelic agents, present a radical view of existence which must be explained in any worldview. Traditional science and psychology fall far short of achieving this goal. Anyone who has a transpersonal experience is suddenly aware, as never before, that consciousness and intelligence are primary attributes of existence and not simply an epiphenomenon of matter.

Science to date has not been able to adequately define or explain consciousness, nor will it ever be able to accomplish this operating under its present rigid guidelines that allow no room for the evaluation of transpersonal experiences.

Even though science finds little evidence to suggest that consciousness and intelligence extend much beyond human form, there is mounting evidence which would tend to indicate that both are primary attributes of the universe at least equal to matter-energy and space-time, and that all organic and inorganic systems have some experiential quality and are thus permeated with consciousness and intelligence. It is now my firm belief that it will eventually become established that this is in fact true.

If one is able to actually "feel" what it is like to be a subatomic particle, atom, molecule, cell, planet, or sun as an experiential manifestation of a supraconsciousness state, then this is evidence (but not proof) that intelligence and consciousness permeate all life forms, as well as all inorganic matter. The Integrated Theory of Intelligence predicts that

intelligence and consciousness is present to some extent in all organic and inorganic systems throughout the universe without exception.

As stated by Charles Tart, there is nothing inherent in the scientific method which precludes the consideration of observations made in altered states of consciousness. As a matter of fact, if an observer is in a different state of consciousness, it is likely that he or she would perceive other variables or interactions and formulate different hypotheses about any event being observed or considered. (Ref. 15.30)

Humans have developed ways to manipulate consciousness. We can now raise consciousness and expand awareness so as to more fully extend human potential. (Ref. 15.31)

Of the various altered states of consciousness that anyone might achieve, the ones that impress me as being of the highest order include the near-death experience and the peak experience. The latter has also been referred to by others as a mystical or quintessential state. They have been called mystical since they have traditionally been associated with religious experiences; however, they are much more frequent in the philosophical, non- religious pursuit of an understanding of the nature of life. They might better be referred to as peak experience or "quintessential consciousness" states. They are much more common than is generally realized, as indicated above. There likely has been a failure to communicate them because of a lack of ability to find the necessary words to verbally express the experience. (Ref. 15.32) There are none! The only other persons who might understand an attempt to verbalize such an experience are those who themselves have reached a quintessential consciousness or peak experience state.

According to Barbara Brown, some of the most profound insights into

the nature of the universe have come through this type of altered state. (Ref. 15.33)

We can conclude that during a quintessential consciousness state, the mind either generates or accepts an extraordinary synthesis about the essence of life and other relationships among things, and happenings within a natural universe of harmony and order. This synthesis transcends expression; however, it can sometimes be approximated by the use of analogy and metaphor. (Ref. 15.34) The experience would appear to trigger a reorganization of knowledge, both learned and experiential, into a higher order of understanding. (Ref. 15.35)

The synthesis of information that occurs during a quintessential state and leads to the transcendent acquisition of knowledge is probably related to a process of reorganizing information already within the unconscious memory. What is most definitely unusual in relation to the usual state of consciousness is the impetus that begins the process as well as the unique ordering of information that results in the experience of a higher order. (Ref. 15.36)

An enigma of quintessential states is that only the essence of the experience is available for recall, and very little of the actual transcendent knowledge can be brought back to consciousness from unconscious memory. (Ref. 15.37) There are meditation techniques, however, which can bring back in bits and pieces some of the higher-order concepts that are synthesized during a quintessential experience. Again, this is how the concepts contained within the Integrated Theory of Intelligence were eventually reconstructed. It took many months of periodically induced meditative states to retrieve the higher-order constructs gained during one "peak" or quintessential experience. One is still left with the perception that only a small part of the experience was ever actually retrieved.

The question has been raised as to whether mystical or quintessential states are accidental or contrived by desire, teaching or by some other unknown activities of mind. (Ref. 15.38) Although there is simply no question that they can occur accidentally or through some unknown activity of mind, once a person has had the experience of one there are ways in which the state of transcendence can be re-experienced, if not at a peak level, at least at a mini-peak level.

The amnesia related to my one peak experience, as I lived it, began soon after its completion and seemed to progress exponentially over the next several days. My recall remained quite acute for several hours but at the end of 24 hours had dulled considerably. Several days out it was mostly gone. One of the biggest disappointments of my life was realizing that the transcendent experience was only transient and that the knowledge gained was evaporating. Losing the state of complete peacefulness and euphoria that I experienced was very disappointing, but the rapid onset of amnesia of the event was the greatest disappointment of all. I was not astute enough to capture any of the experience in recorded form immediately after it happened, nor would time have permitted me to do so anyway. Even if I had tried, there was still no verbal description which could have begun to capture the essence of the event.

Nevertheless, the impression of the experience upon my mind was so completely awesome that there has never been any doubt about its happening. A small part of the memory is permanently embedded and is recalled to consciousness many times each day. A much greater part of the experience is apparently recorded in my unconscious and has been partially recalled over time with effort. The one thing which dulls the disappointment of the loss of the transcendent experience is the excitement generated by the knowledge that I have been able to retrieve some of the information that might have been completely lost to my consciousness. Another excitement generated is the implication of the

retrieval event. If it is possible for one person to retrieve information gained during a transcendent experience, then others can do it also. I believe that this definitely and unquestionably provides a way to obtain new knowledge and higher-order understanding of our reality.

The remarkable synthesis and experience of abstract, complex, quintessential ideas illustrates the tremendous capacity of mind to reorganize information and so evolve higher-order concepts and fundamental truths that ordinarily are beyond conceptualization. (Ref. 15.39)

Barbara Brown's description of the quintessential experience is essentially the same as Abraham Maslow's description of the peak experience and would include the following, most of which are shared by those who have had such experiences:

> (1) There is a dissociation of thought from both the emotions and all bodily sensations. There is a complete loss of awareness of all incoming sensory information from the environment. The mind feels detached from the body and the body's senses.
>
> (2) There is a total focus of attention and of all mental operations on the special kinds of thoughts, a focus not achievable during ordinary consciousness.
>
> (3) Insights and enlightenments may be experienced that usually do not occur in ordinary consciousness, and that are intensified to such an extent that one could never otherwise hope to fully appreciate them in an entire lifetime.
>
> (4) There is a subsequent usefulness of the insights both to the individual and/or to society.
>
> (5) There is the sensation or perception of being an integral part of the essential nature of the universe. (Ref. 15.40)

William James stated in 1929, "This overcoming of all the usual barriers between the individual and the Absolute is the great mystic achievement. In mystic states we both become one with the Absolute and we become aware of our oneness. This is the everlasting and triumphant mystical tradition, hardly altered by differences of clime or creed." (Ref. 15.41) There is the feeling that "all is one." (Ref. 15.42)

From my own perspective, there is also the perception of omniscience as reflecting a state of mind where one believes oneself to have virtually complete understanding of reality--"all the puzzle pieces fit." There isn't any question that one can ask oneself for which one doesn't have an immediate answer that perceptually agrees with every bit of knowledge that one possesses. There are no contradictions or paradoxes and there are no doubts. Whether or not there is any reality to this perception of omniscience is definitely arguable; however, it is an undeniable component of a peak experience.

It apparently doesn't matter what factors enter into producing the peak or quintessential experience. It would seem that the result is essentially identical in all respects. Aldous Huxley and John Blofeld have described the similarity between satori achieved after years of training, the tantric Buddhist tradition and the mescaline experience. They were virtually the same. (Ref. 15.43)

The field of holography has provided one possible model of the fundamental unity of all things as perceived during peak experience. This model suggests that every separate thing may contain a photograph-like image of the entire universe, some much more detailed than others. The human brain may very well work on this principle. As more information is stored in a brain, its ability to conceive an image or thought comes closer to approaching reality. Our holographic minds all share common perceptions which are virtually universal in scope. The more detail in which a mind is programmed with accurate information,

the more accurate is its concept of reality. This is similar to the holographic image which is fuzzy and indistinct when only a small part of an interference pattern is projected, as compared to a highly resolved image when the entire interference pattern is used.

Arthur J. Deikman has stated that the use of the word "illumination" as a metaphor for new insights gained during peak experience may not be just a metaphor. It is conceivable that there is an actual liberation of energy which is perceived or experienced as light during the peak experience, as the resolution of an unconscious conflict occurs, thus permitting the feeling of total peace and serenity. Liberated energy which could be experienced as light may be the core sensory experience of this altered state. (Ref. 15.44)

Some of the features of a peak experience have feasible explanations based on currently known brain physiology. The perception of omniscience might be explained as follows. During a peak experience or other state of higher consciousness, the brain has access to a much greater amount of stored information and is processing and integrating both stored and incoming information in the unconscious mind at a higher rate than during ordinary consciousness. This more efficient and effective processing of information would appear to be the result of neurons working together in a more coordinated or coherent fashion through dendritic connections. This hypothesis is based on evidence that a more intelligent brain has more dendritic connections than a less intelligent one. It would seem that the more dendritic connections there are, the more information stored in the unconscious that can be processed and integrated per unit of time. One might speculate that more dendritic connections present between neurons allows for potentially higher states of consciousness. This in turn allows one to creatively achieve new higher-order levels of understanding on virtually any subject of one's choosing, and hence the perception of omniscience.

The higher level of understanding experienced during peak experience also results, at least in part, in the euphoric state. One's fears, guilt and other negative feelings are put into context and are better understood by the individual, thus relieving any associated anxieties. One is more capable of understanding any negative guilt-producing past behavior, thus becoming more able to forgive oneself, and thereby putting the difficulty to rest. Fears can also be understood and dealt with in similar fashion.

The perception of slowed time can be explained on the basis that fewer "time-related events" are being perceived by the conscious or unconscious. Our minds are focused inwardly, thereby effectively ignoring incoming stimuli. The fewer processed time- related incoming stimuli perceived by any individual, the greater the likelihood of time perception error in the direction of slowing.

The dissociation of thought from all bodily sensations would appear to reflect a shutdown of perception to most incoming sensory stimuli. This hypothetically could result in a freeing of neural circuits and/or a more efficient use of chemical mediators at the synaptic level, thus allowing the more effective processing of stored information. The feeling of detachment from the body can also be the result of the shutdown of perception to incoming stimuli. In essence the physical body is asleep. This loss of perception to incoming stimuli also allows for a greater focusing of attention because of the lack of competition from sensory organs that also require the use of neural circuits.

An increase in consciousness leads to an increase in awareness of all else, including other people, animals and the environment. One becomes more sensitive to the needs of all others and of the environment as well, because one realizes that everything is interrelated and that any person's well-being is ultimately connected to the well-being of everything else in existence. As one gains more understanding of one's reality, the result

is an enhanced social consciousness. An increase in consciousness increases one's sensitivity to the needs and importance of others. One intuitively knows that by helping others and perturbing the environment as little as possible one ultimately helps oneself as well.

This is more than just an intellectual understanding. It is an intuitive, all-embracing knowing. It becomes part of the very fiber of one's existence to the extent that it influences every conscious and unconscious decision. One accepts a greater measure of responsibility as it relates to helping the betterment of humankind and all else in existence. The greater the level of consciousness achieved and the accompanying enlightenment which results from it, the greater the responsibility perceived as it relates to all of existence. If you have more to give, then you must give more! There is a sense of obligation. With increased consciousness, there is a greater awareness of everything. Following the peak experience, my self-awareness seems to be the same; however, my consciousness of the rest of existence has increased significantly.

Itzhak Bentov suggests that there is both objective and subjective space-time, and that during an ordinary state of consciousness the two coincide. They become separated during altered states of consciousness and we then function in subjective space-time that can be expanded greatly. Bentov also suggested that a person's level of consciousness could be expressed mathematically as a ratio of one's subjective time to objective time.

$$\textbf{Level of consciousness index} = \frac{\textbf{Subjective Time}}{\textbf{Objective Time}}$$

Thus the greater the subjective time experienced, the higher the level of consciousness. (Ref. 15.45)

The existence of altered states of consciousness gives us an excellent opportunity to study to better advantage the properties of the ordinary state of consciousness, since the properties of the latter are amplified during certain altered states.

Almost everyone will experience some type of altered state of consciousness during their lifetime. At least one-third of all individuals will even have a peak experience. It is very natural to doubt the existence of this type of altered state of consciousness unless one has personally experienced it. For those who have, there is no lingering doubt as to its validity.

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Chapter 16

Supraconsciousness States

(14) States of supraconsciousness are obtainable that can lead to the creation of higher-order concepts and a greater understanding of our reality. There is an increasing amount of evidence accumulating, much of it scientifically based, which would indicate that profound leaps of understanding can be achieved during certain altered states of consciousness.

According to Andrew Weil, author of The Natural Mind, there exists a source of direct information about reality within each of us that can teach us new information. Many commentators have called this "superconsciousness" to differentiate it from lower subconscious functions of the unconscious mind. (Ref. 16.1) During this particular altered state of consciousness intuitive flashes are prone to occur. He believes that some of our greatest scientific thinkers have solved problems in this manner. (Ref. 16.2) During this state of supraconsciousness there is an acceptance of the ambivalent nature of things. Those concepts ordinarily seen to be in conflict or as opposites are perceived as harmonious. The apparent dualistic nature of reality is transcended so that there is an acceptance if not an understanding of it. (Ref. 16.3) Such phenomena as life-death, love-hate, pain-pleasure, particle-wave and mind-body are no longer seen as being in conflict but can be experienced in a common frame of reference within one reality. (Ref. 16.4)

It is becoming increasingly apparent that virtually all scientific insights come in the form of revelation rather than in a logically deductive

manner. The latter is used to sort out false conjectures that are internally inconsistent and which can themselves also masquerade as revealed insight. All new thought begins intuitively and is logically processed as a secondary phenomenon. The actual moment of scientific insight increasingly begins to appear as though it were an instance of mystical revelation. (Ref. 16.5)

Charles Darwin justifiably has been given almost full credit for the theory of evolution since he did much more work than anyone else to give it a strongly-founded scientific basis. However, as is well known, he is not the only one to have formulated the theory. The naturalist-explorer Alfred Russel Wallace, while lying ill with a fever, experienced a sudden flash of insight. While tossing in bed in a state of restlessness, he had been thinking about the concept of how species might be transmuted. The answer came in an intuitive flash. Four months later on June 8, 1858, Darwin received a twelve-page summary of Wallace's ideas on evolution, which exactly paralleled his own. (Ref. 16.6)

According to Marilyn Ferguson, people throughout history have had transformative experiences both accidentally and deliberately. Just as Alfred Wallace experienced, deep inner shifts may occur in response to grave illness, disciplined contemplation, creative effort, peak emotions, wilderness treks, spiritual exercises, controlled breathing, techniques for "inhibiting thought," psychedelics, isolation, music, hypnosis, meditation, reverie, as well as in the wake of intense intellectual struggle. (Ref. 16.7) "These systems aim to fine-tune the mind and body, to expand the brain's sensing, to bring the participants to a new awareness of vast untapped potential. When they work, it's like adding sonar, radar, and powerful lenses to the mind... (Ref. 16.8) Laboratory investigation, as we shall see, shows that these methods integrate the brain's activity, making it less random, provoking it into higher organization. Brains undergo a quite literal accelerated transformation.... The gifts of insight--of making imaginative new connections--once the

specialty of a lucky few, are there for anyone willing to persist, experiment, explore." (Ref. 16.9)

There have been many stimuli identified, by creative people themselves, which help precipitate their bouts of creativity. In addition to those listed above, such things as fatigue and sleeplessness have been mentioned. However, most are idiosyncratic and only work for that specific individual. Creativity also appears to be enhanced by isolation and sensory deprivation. (Ref. 16.10)

In their book Higher Creativity: Liberating the Unconscious for Breakthrough Insights, Willis Harman and Howard Rheingold argue that creativity can be cultivated. They advance various techniques for reaching into the unconscious, which they view as a great idea processor, with the end result of stimulating creativity. They believe that creativity may be triggered in various ways, including intuitive flashes, intense emotional responses, chance happenings and self-induced drug states. (Ref. 16.11)

According to Harman, creativity can be developed into a skill that most can learn over time through effort and practice. Since imagery is perceived to be the language of the unconscious, then one must learn to increase one's ability to increase mental imagery, and he discusses ways this can be accomplished.

He also states that, "When we all learn the tricks of the creativity trade that we formerly reserved for geniuses, the masterpiece of our collective endeavors and breakthroughs could be not a painting or a theorem, but a new way of life." (Ref. 16.12)

According to Harman, "All we have to do is to consciously program the unconscious with the correct input, and, like a mathematical formula,

input plus processing time will equal output.... [T]he more precisely you can state any problem, the more swiftly and accurately your unconscious idea processor can churn out the solution." (Ref. 16.13)

Harman also discusses ways to achieve breakthrough experiences by utilizing a combination of visual imagery, reprogramming the unconscious mind with positive affirmations, alert relaxation, attention focusing, and lucid dreaming. (Ref. 16.14)

Willis Harman has stated, and I very much agree,

> "It is human unconscious programming that has to be changed, which is totally feasible. What would be the motivation for people to undertake this self-programming? The answer is: Because it leads to personal breakthroughs, to feeling more self-fulfillment, to an exhilarating life, and to a viable global future. This is not theoretical or speculative. Survey research and a vast assortment of less formal indicators make it clear that there is a growing network of individuals who have already started." (Ref. 16.15)

Altered states of consciousness such as those induced by hypnosis or psychedelic agents can assist in producing the creative act and facilitating the intuitive process. Both appear to focus consciousness so intensely that sub-threshold stimuli are perceived, thus heightening responsiveness to them. Both also can assist breakthroughs into the preverbal realm where creative inspiration has its origins, and this is accomplished apparently by gaining access to unconscious material. Many artists and scientists have claimed that their efforts at innovation existed as moods and feelings prior to their verbal or mathematical expression. (Ref. 16.16) This would suggest that the use of language is not a prerequisite for insight and creativity, which would therefore not preclude higher animals from this phenomenon, although in their case it must be presumed to be of lesser magnitude. The behavior of a cat is basically its own creation as it has continued to evolve to the present.

Krippner has stated that autohypnosis, as in Zen meditation, can result in increased concentration, a focusing of attention, and an increased receptivity to creative ideas. (Ref. 16.17)

Sergei Rachmaninoff, during a period of morbid brooding, was treated with hypnosis by Dr. Nikolai Dahl for a period of three months. The hypnotic suggestion was remarkably effective, his gloom evaporated, and he began composing again with both speed and inspiration. One of his very best works, Concerto No. Two in C Minor for Piano and Orchestra, was the result of this hypnotic treatment, and he openly acknowledged his debt to Dr. Dahl and dedicated the concerto to him. (Ref. 16.18)

An experiment was reported by McCord and Sherrill in 1961 in which they placed a mathematics professor into a hypnotic trance, during which they suggested that after he awakened he would be given some calculus problems to solve, and that he would be able to do them with high accuracy at a faster rate of speed than ever before. Problems that ordinarily might have required two hours to solve were completed in twenty minutes. The mathematician reported afterward that he had been able to skip usual steps in the mathematical process by performing them in his head, thus reducing the time required, and without loss of accuracy. His perception was that his unconscious mind had participated in the calculations to a greater extent than usual. (Ref. 16.19)

Patricia Bowers reported an experiment in 1965 involving 80 female college students, a portion of whom were placed into a hypnotic trance and told that they had the ability to be creative if they would allow themselves to make use of all their relevant experiences. They were told to perceive in unconventional ways, to notice aspects of problems overlooked previously, to ignore the possibility of criticism, to recall past moments of insight and the feelings associated with them, and to

feel confident about their ability to do well on creativity tests. The non-hypnotized control group received the same instructions and participated in a program of relaxation that lasted as long as the hypnotic induction period for the other group. The difference between the hypnotized group's scores and those of the control group were reported as highly significant, with the hypnotized group doing significantly better. Prior to the instructional period both groups had been given a number of creativity tests devised by Guilford and had scored the same. (Ref. 16.20)

Philip Goldberg, in his book The Intuitive Edge, explores "deeper" or higher states of consciousness as one technique for expanding intuition and creative thinking. He believes that both can be enhanced, particularly through transcendental meditation. (Ref. 16.21)

Fritjof Capra has stated that insights tend to come suddenly during a state of relaxation, such as lying in a bath or walking in the woods. However this is usually preceded by concentrated intellectual activity. Somehow the intuitive unconscious mind produces the answer. (Ref. 16.22)

According to Stanley Krippner, psychedelic drugs have also been used for creative purposes. Navy captain John Busby in 1966 reported using LSD to solve an elusive problem in pattern recognition during the development of equipment for a Navy research project. Busby stated, "With LSD, the normal limiting mechanisms of the brain are released and entirely new patterns of perception emerge." (Ref. 16.23) It also must be stated that the unsupervised use of any psychedelic agent can be very hazardous and is not recommended.

Over three decades of extensive psychedelic research using LSD has led Stanislav Grof to conclude that this substance is a non-specific catalyst or amplifier of mental processes that brings to consciousness various unconscious information. He has stated that the phenomena observed

following the administration of LSD are very similar to that which has been seen in meditative practice, hypnosis, and other new experiential therapies. (Ref. 16.24)

Grof has witnessed the remarkable healing and transformative potential of these agents for producing non-ordinary or altered states of consciousness. (Ref. 16.25) They have also given us a new tool for interpreting material from history, comparative religion, the ancient mysteries of death and rebirth, rites of passage of various cultures, shamanic procedures of all times, aboriginal healing ceremonies, spiritual and mystical traditions and other phenomena of great cultural significance. (Ref. 16.26)

According to Robert Mogar, investigation of LSD during the early and mid-1960s would suggest that it is also a liberator which facilitates accurate perception, self-insight, and performance enhancement. (Ref. 16.27)

Spencer reported in 1963 that the use of LSD enables the recovery of unconscious memories which are extremely realistic to the patient, to the extent that they are frequently accompanied by changes in body image. Patients reported that in recalling traumatic experiences there was a perceived change in body size and age corresponding to when the actual event occurred. (Ref. 16.28)

There are researchers who have recommended the use of psychedelic drugs to study creativity, since they appear to facilitate this process. (Ref. 16.29) Experimental results suggest that psychedelic agents may facilitate a lasting change in the direction of increased creative expression and self-actualization. (Ref. 16.30) According to Charles Tart, there appears to be increased access to unconscious data, more fluent free association, and a heightened ability for visual imagery. (Ref. 16.31)

An exploratory experimental study conducted by Harman, McKim, Mogar, Fadiman and Stolaroff attempted to answer three empirical questions:

(1) Does the psychedelic experience enhance creativity?

(2) Are concrete, valid feasible solutions derived as viewed by the pragmatic criteria of science and industry?

(3) Are there long-term personality changes in the direction of increased creativity and self-actualization? Twenty-seven male subjects participated in this study, including engineers, physicists, mathematicians, architects and others. Most had no previous experience with psychedelic drugs. The subjects were instructed to select one or more problems of professional interest which required a creative solution. Some of the participants had worked weeks to months on their chosen problems without finding a satisfactory solution. A protocol was developed and followed which allowed placement of the individuals into a psychedelic state. This required some participant training and instruction prior to the sessions.

Two hundred milligrams of mescaline was the agent used to facilitate the altered state. Creative performance was evaluated in three ways:

(a) an analysis of score changes on tests of creative ability given several days before and again during the acute phase of the experimental session;

(b) a content analysis of subjective reports for evidence of generally recognized components of the creative process and distinguishing features of the creative solutions;

(c) subjection of the solution derived during the session, including theories, designs and inventions, to pragmatic scientific and industrial testing.

The tentative conclusions derived suggested that if given according to a carefully structured regimen, psychedelic agents seem to facilitate creative problem-solving, particularly during the "illumination phase." There is also the suggestion that various degrees of increased creative ability may continue for at least some weeks following a psychedelic problem-solving session. (Ref. 16.32) Experiments with the drug MDMA (34-methylene- dioxy-methamphetamine) indicate that it is quite useful in aiding communication and producing clarity, promoting insight into problems, increasing creativity, expanding mental perspective and insight, and promoting transcendent experiences. (Ref. 16.33)

Psychologist Roger Walsh, in his book Psychedelic Reflections, indicates that many highly creative people privately acknowledge that psychedelic agents have played a vital role in advancing their understanding of projects that they were working on. (Ref. 16.34)

A poet, Samuel Taylor Coleridge, created one of his most famous poems, "Kubla Khan," during a dream-like state brought on following the oral administration of an opium-containing medication, Laudanum. According to Coleridge's description, he immediately fell asleep and composed no less than 200 to 300 lines without any sense of effort. Upon awakening he perceived himself to have a distinct recollection of the entire poem. Shortly after he began recording the lines of the poem he was interrupted by a person on business, which precluded his finishing the poem until an hour later. By then he had only a vague recollection of the contents of the vision so that the finished product was only 54 lines long. (Ref. 16.35)

Various other substances have also been associated with creative ideas, including alcohol, coffee, marijuana and other drugs. However, these have been used only as triggering mechanisms. In most instances creativity is preceded by sheer hard work.

Transformative experiences can be intentionally triggered in many ways. However, all share a common quality. They focus awareness on awareness. (Ref. 16.36) Ferguson has listed four stages of transformation. The first stage is the entry point, which can be brought about by any spontaneous mystical or psychic experience, or can be precipitated by a psychedelic drug. According to Ferguson, "It is impossible to overestimate the historic role of psychedelics as an entry point drawing people into other transformative technologies.... The changes in brain chemistry triggered by psychedelics cause the familiar world to metamorphose. It gives way to rapid imagery, unaccustomed depths of visual perception and hearing, a flood of `new' knowledge that seems at once very old, a poignant primal memory.... [P]sychedelic awareness is not fuzzy but many times more intense than normal waking consciousness."

The second stage is exploration, where new answers are sought by letting inner knowledge come forth in a new synthesis. The third stage is integration, where intuition leaps ahead of understanding. One experiments, refines, tests new and old ideas, sharpens and expands upon them. Many individuals explore subjects which formerly held no interest for them, including philosophy, quantum mechanics, brain research and psychology.

The fourth stage brings about conspiracy, where an individual discovers other sources of power and different ways to use it for fulfillment of self and in service to others. This is done more and more in conjunction with other conspirators. (Ref. 16.37)

Ferguson states that, "The `importance of process' is another discovery. Goals and end-points matter less. Learning is more urgent than storing information. Caring is better than keeping. Means are ends. The journey is the destination... (Ref. 16.38) [T]he dream of the Aquarian Conspiracy in America is a framework for non-materialist expansion: Autonomy, awakening, creativity--and reconciliation." (Ref. 16.39)

One of the outcomes of the continued evolution of intelligence and consciousness is a growing movement that has been recognized by various people. It comprises the "growing tip" of humanity, as defined by Abraham Maslow. It has been referred to as the "Aquarian Conspiracy" by Marilyn Ferguson. This is a leaderless network without a political doctrine or manifesto whose strategies are pragmatic and scientific. (Ref. 16.40) The common denominator which sets them apart from the rest of humanity is their predilection for transformative experience, or as Maslow has defined it, "peak experience." The mind of humankind has evolved to its present level, and continues to evolve even now, as our brains have become greater in their ability to both store and integratively process more and more information. As this process continues, humans will be subject to continually higher states of consciousness. Even though the process may seem gradual to us, it will actually occur quite rapidly relative to universal time since it continues its upward progression at an accelerated non-linear rate, the exact slope of which has yet to be established.

Creative thinking, and the ability to synthesize new ideas and achieve a higher level of understanding of reality, is an attribute which lies at the uppermost end of the intelligence spectrum. We are beginning to understand the processes that occur during this most important act, even though we have only scratched the surface at this point in time.

Graham Wallas has identified four stages in creative problem- solving. The first stage requires preparation, which usually involves a long period of intense conscious work without success. The problem is then often put aside and no longer thought about consciously, during which a period of incubation occurs. The unconscious mind would appear to continue the quest for a solution during this incubation interval. If successful, the next stage results in illumination, or sudden insight into the solution of the problem. This illumination is often accompanied by a feeling of certainty that the solution is correct. A stage of verification is then required for the benefit of and obligation to others. (Ref. 16.41)

During the preparation stage the creative scientist spends an enormous amount of his time and effort storing away isolated facts and concepts (information), which in the illumination stage (most often a moment of hyperconsciousness) cascade together in a fusion process that produces a new higher-order concept.

The higher one's state of consciousness at any particular time, the greater the chance of conceiving a new thought, idea or concept, and the greater the number of new ideas that one will conceive per unit of time. The overall quality of any new higher-order thought will probably depend very greatly on the stored information in one's unconscious mind. If one has carefully scrutinized all of the input data consciously put into his one's mind-brain computer, then any new concept that might be conceived will have a better chance of being correct than if one had been careless; "garbage in, garbage out."

In a peak experience, whatever prior life experiences or perceptions of reality are stored in the unconscious will definitely influence the types of phenomena and insights gained. One who believes in archetypal beings (angels, demons, etc.) might experience their presence in one's altered state. My own peak experience was influenced by all of the previously stored scientific data acquired over many years, along with all other

memories. It suddenly allowed their integration into a new higher-order synthesis. A chain reaction of associations occurred.

During a peak experience stored information is being integrated much more efficiently and effectively. One can process unconscious bits of information and integrate them with conscious thoughts. As our understanding of all processes occurring around us increases in a growing aggregate of stored bits of information, so does our consciousness increase. The greater the amount of stored bits of information in any organism or animal, the higher the potential level of consciousness or protoconsciousness present. The more effectively any animal can integrate the stored bits of information, the higher is its actual consciousness and the more creative its thinking process. New ideas are generated when stored bits of extraneous information merge to form a higher-order concept.

Any state of enhanced awareness allows one to be more creative and whole-seeing, and risk-taking is no longer as intimidating. We have greater access to unconscious material, and we are capable of focusing our attention in whatever direction interests us. (Ref. 16.42) Certain individuals do appear to have the capacity to be more creative than others. Although the attribute of creative potential must to a certain extent have a genetic predisposition--just like any other facet of intelligence--it can unquestionably be cultivated as well.

Not everyone accepts the premise that a stereotypical creative personality profile exists, since this premise seems to harbor some contradictions; however, most studies do agree on certain issues. In general, creative people are hard-working, persevering, relatively independent and non-conformist in their ideas, and are generally more flexible in their thinking. But in most respects they are quite diverse in personality, much like the rest of the population. (Ref. 16.43) It has also been demonstrated that many creative people grow in their powers

throughout adult life, and that creativity is not confined to youth. (Ref. 16.44)

A group of architects were studied because their occupation requires a great deal of creativity. Among them as a group, it was determined that creativity had virtually no correlation with IQ above a certain required minimum level. The more creative architects had many interests commonly classified as feminine. They were generally self-confident, uninhibited, outspoken, flexible, independent, strongly motivated, and they came from families showing greater cultural, artistic and intellectual interests. There was lack of an extreme emotional closeness to their parents.

It has been repeatedly determined that there is virtually no correlation between academic achievement and creative potential. In studies of physicists, biologists and psychology graduate students, it was determined that creativity in their professional achievement, as reflected in their attainment of patents, prizes, projects and the opinions of their professors and colleagues, was in no way predictable from their grades, aptitude tests or achievement scores. While their academic skills and IQ scores are usually higher than average, the most intelligent and scholastically accomplished were no more creative than the least. (Ref. 16.45)

Creative people are highly esthetic and thrive on the complex, the intricate, the asymmetrical and complicated. They appear to have the uncommon capacity to integrate the wealth of chaotic sensory experience into a higher order of mental synthesis. They are slow to label and screen out the irrelevant, and they perceive life rather than judge it. This facilitates heightened awareness of not only the outside world but of the inner self as well. (Ref. 16.46) The more creative person tends to reveal an openness to his own feelings and emotions. They have a more childlike freedom of imagination. (Ref. 16.47)

Visual imagery would appear to be a very important component to the creative thought process. This ability appears to vary widely among different individuals. Nikola Tesla at one extreme reportedly could see visual images in great detail to such an extent that he could build complex inventions without drawings. Aldous Huxley, on the other hand, confessed to being a poor visualizer and indicated that words did not evoke pictures in his mind. It has been speculated that perhaps one reason Huxley indulged in drugs is that it allowed him to obtain a more visual perception of reality. (Ref. 16.48)

Einstein admitted to having a very visual mind and he apparently thought in terms of images. It has been conjectured that his most fundamental insights were derived from spatial models rather than from a purely mathematical line of reasoning. Even he himself stated that spoken and written words did not seem to play any role in his thought process. (Ref. 16.49) In my own case, the visual imagery which occurred during my peak experience played a major role in the synthesis of all of the concepts presented in this book.

Creativity also appears to require a synchronization of the right and left brains working in harmony, and new ideas often emerge in drowsy or "twilight" states of consciousness. (Ref. 16.50)

It has been determined by scientists that at the instant of creative flash (the "Eureka" event), the electrical pattern of the brain is altered, and individual neurons change the number and shape of their dendrites, dendritic spines, and synapses, thus creating new patterns of electrochemical message transmission. (Ref. 16.51)

It has been said that Einstein appeared to live in a semipermanent alpha brainwave state. He could maintain continuous high-amplitude alpha waves while solving complex mathematical problems. (Ref. 16.52)

In any extended creative work there appears to be a continuing interplay between the conscious and unconscious. Each step in the working out of a problem feeds new material into long-term memory that in turn leads to the emergence of new illuminations from the busy unconscious. It took Einstein ten years to work out the theoretical implications of his intuitive vision of riding a light beam. (Ref. 16.53)

Through the processes of introspection, meditation and analysis of peak experience, I have concluded that a mathematical expression of Creative Potential can be formulated, which to date is incomplete but still provides useful information.

Creative Potential $\propto$ (i)(it)(if)(im)(t)(c)(ie)(x)

(i) = total amount of stored information
(it) = innate talent (genetic predisposition)
(if) = intensity of focus of concentration
(im) = intensity of motivation to create (level of desire or will)
(t) = total time spent developing talent
(c) = level of consciousness (during P.E.--which is an elevated level of consciousness--creativity reaches its highest potential)
(ie) = intensity of emotion (euphoria) experienced during creative act
(x) = apparently random and yet-to-be-understood chance phenomenon

Some of the factors in the equation imply the presence and operation of intent and purpose.

The attribute of creativity is the highest function of intelligence, which more than anything else separates us from other animals. It would appear that it is primarily the cerebral, cortical part of the brain which allows humans to be creative. This has not yet been conclusively established, since it has been found that hydranencephalic individuals have seemingly normal intelligence even though they have very little if any cerebral cortex. Their ability to be creative has not yet been fully evaluated.

Even though it is my opinion that states of supraconsciousness are an unequivocally real phenomenon, some individuals will undoubtedly remain skeptical about such occurrences pending further scientific validation. The acknowledgement of their existence is easiest for a person who has experienced one. These states would seem to be the most important route leading to conceptual breakthroughs in our understanding of reality. It would appear to be highly probable that the Special and General theories of relativity were conceived by Einstein while in a supraconsciousness state, whether or not he recognized it as such at the time. As we begin to find ways to precipitate states of supraconsciousness at will, we can advance at an accelerated non-linear rate our understanding of the universe and of the integral part we play within it.

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Chapter 17

Emotions System -- Cause and Effect Relationships with Intelligence

(15) The emotions system is a higher-level property of intelligence, and the emotions experienced by an organism affect its intelligence in the way that it expresses itself. Both positive and negative emotions have aided the evolution of intelligence in the direction of increasing complexity. They motivate a great deal of our behavior much as do basic drives by causing humans, as well as animals, to be constantly seeking pleasure and avoiding pain. The memory-encoding process is also heavily influenced by the experiencing of emotion, as is the operation of the immune system. They also influence our basic instinct for survival. As a matter of fact, our entire perception of reality is very much dependent upon the experiencing of emotions. Because of the far-reaching effect that they have upon all of us, they are a very important attribute of intelligence.

Carroll Izard defines emotion to represent a complex phenomenon having neurophysiological, motor-expressive, and experiential components. He believes that the process of interacting components that produce emotions is an evolutionary biogenetic phenomenon. (Ref. 17.1)

There is strong evidence indicating that the expressions of the fundamental emotions are hereditary and bear a close resemblance to the expressions of non-human animals, especially primates. (Ref. 17.2) There are at least ten fundamental emotions that have been identified, and which include: interest-excitement, enjoyment-joy, surprise-startle,

distress-anguish, anger-rage, disgust-revulsion, contempt-scorn, fear-terror, shame/shyness-humiliation and guilt-remorse. Each emotion varies along a gradient of intensity indicated by each of two words. (Ref. 17.3)

Interest provides motivation for both learning and creative behavior. It is the most commonly experienced positive emotion. It is important in the development of competence and intelligence. It can be a necessary amplifier of the instinct-for-survival drives. Izard has stated, "The emotion of interest can be invested in possibility and thus support investigation, exploration, and constructive activity." (Ref. 17.4) It characterizes an infant's functioning from the beginning of life, and it is the focusing power of interest that makes possible perceptual learning and cognitive development. Interest may be focused on anything, and it facilitates human welfare by investing in intellectual, creative, and artistic activities. (Ref. 17.5)

Joy is associated with a sense of confidence and a feeling of being loved. It seems to facilitate the survival instinct and the evolution of intelligence by increasing desire for continued life. It is a feeling which is difficult to elicit. One cannot produce it predictably with any specific behaviors. However, it often follows personal achievement or creation. The experience is so pleasant that it motivates an individual to actively seek it. As elusive as the feeling or emotional experience may be, it has been determined that the purest and most meaningful form is felt after some creative or socially beneficial act that was not done for the express purpose of obtaining joy. Joy is not the same as pleasantness or pleasure. (Ref. 17.6) It is somehow a motivational force facilitating growth or self-actualization. (Ref. 17.7) Joy facilitates and increases social responsiveness and altruism, and may help promote attachment, commitment or addiction to objects that have helped reduce drives or negative emotions. (Ref. 17.8) Maslow and Rogers maintain that openness and honestly are essential for realizing one's full potential and for experiencing

joy. (Ref. 17.9) Bradburn showed that people who participate more socially and have more new and varied experiences are more apt to have positive affective experiences. He also determined that money and status "may enable one to increase his joys, but it cannot decrease his sorrows." (Ref. 17.10)

Distress or sadness makes one responsive to one's own problems and to those of the world. It is the most frequently experienced negative emotion and also serves important biological and psychological functions. According to Tomkins, distress is a density-level affect, and occurs as a result of a continued excessive level of stimulation from such things as pain, cold, noise, heat, bright lights, loud noise, failure and loss. (Ref. 17.11) It can promote remedial strategies which can attack its source. (Ref. 17.12) Distress facilitates group cohesiveness whether it be with family, social groups or society. (Ref. 17.13) Distress also plays an important role in the evolution of intelligence by continually providing new challenges to overcome, which results in stimulated creativity, and often in the finding of novel solutions to new problems.

Anger can motivate destructive behavior, but can also prove adaptive as a source of strength and courage when it is necessary to defend personal integrity or loved ones.

Disgust helps motivate one to maintain personal and group standards, and good body hygiene.

Contempt can lead to prejudice and even cold-blooded killing, but can also provide a positive function for human preservation when directed against enemies of human welfare.

Fear provides motivation for avoiding dangerous situations.

Shame can produce feelings of ineptness and isolation, but shame-avoidance can foster self-corrective activities. (Ref. 17.14) Shame has also had a role in the evolutionary process. It sensitizes the individual to the opinions and feelings of others and facilitates a degree of social conformity and social responsibility. If properly dealt with, shame can play a positive role in self-development and self-improvement. Reflection on the shame experience can increase self-knowledge. (Ref. 17.15)

Guilt can dominate and torment the mind, but the anticipation and avoidance of guilt can motivate an individual to develop personal and social responsibility.

Surprise acts to clear the nervous system of ongoing emotion and cognition so that an organism can respond to the sudden change it has experienced. (Ref. 17.16)

The emotions system strongly influences both human and animal behavior by creating needs that require satisfaction. We all seek pleasure and attempt to avoid pain.

The basic instinct for survival would at least in part seem to operate through the emotions system. The periodic experiential process of feeling good would seem to make the continuation of life a desirable goal, thus enhancing the motivation to survive.

There is no way of knowing at this stage of our knowledge just how far down the evolutionary ladder emotions are experienced; however, it would seem possible that some types of feelings or protoemotions exist in all life forms. This remains speculative since even though all living organisms require some type of motivational system to produce behavior favorable to the survival of the organism, it is conceivable that the

presence of drives could accomplish this task without the need for emotions.

It has been argued that there is continuity between embryological development and the development of emotions, consciousness, thought and action, and that all living organisms are characterized by a biological directedness that is experienced as desire and purpose. (Ref. 17.17) Animal behavior, as well as human, appears to be very strongly influenced by emotions which provide this desire and purpose and motivation for action.

To suggest that animals experience emotions would first of all require the presence of some level of consciousness on their part. There are researchers who believe there is much evidence to suggest that at least higher animal forms do experience discrete feeling-states. Donald Hebb has produced a full-blown fear state in chimpanzees by the presentation of a display significantly at variance from what they had previously perceived. For instance, a chimpanzee will become extremely frightened, excited or anxious if it sees a mutilated or dismembered body of another chimp. (Ref. 17.18) Jane Goodall witnessed the display of grief in an eight-year-old chimpanzee when his mother died. After manifesting behavior that was interpreted to represent severe depression, the chimp died 25 days later. (Ref. 17.19)

According to biologist Wolfgang Kohler, higher animals clearly experience emotions. After testing chimpanzees, he stated, "Their range of expression by gesture and action is very wide and varied, and beyond all comparison, superior, not only to that of lower apes, but also to the orangutan's. Certain chimpanzee emotions are easily comprehensible to us human beings--for example, rage, terror, despair, grief, pleading, desire, and also playfulness and pleasure." (Ref. 17.20)

John Flynn is a researcher who has demonstrated that it is possible to trigger a complex form of affect-laden behavior in cats by direct electrical stimulation of certain brain centers. Full-blown attack behavior with associated facial expressions can be precipitated by this method. A whole set of behavior patterns, which are presumably accompanied or even triggered by specific affective states, can be produced by internal as well as conventional external environmental stimuli. (Ref. 17.21)

Human brains have been found to contain various endorphins that are potent natural pain killers and can also cause feelings of euphoria and belonging. Similar neuropeptides have been found and measured in many forms of animal life from protozoa to fruit flies. These chemicals appear to put them in the "mood" to mate, eat or flee from danger. Opiates, which are basically similar to human neuropeptides, can induce protozoa to eat. Even bacteria appear to have primitive likes and dislikes. They are attracted by sugar and repelled by salt. (Ref. 17.22)

Since the same neuropeptides found in humans that result in the experiencing of emotions are also found in simple one-celled organisms, it is tempting to conclude that even the simplest of animals also experience emotions when it can be experimentally demonstrated that these neuropeptides do influence their behavior.

Dramatic changes in bodily functions occur during any strong emotion as transmitted through neurochemical pathways. These changes affect the perceptions, thoughts and actions of the person. Emotions activate the autonomic nervous system and change the flow of glandular secretions and neurohumors. (Ref. 17.23) Emotional states also affect muscle tension of the face and body as well as the circulatory and respiratory systems. (Ref. 17.24)

A strong case can be made for considering the emotions as an integral part of the perceptual process. It is emotion and its effects upon neurohumors and hormones which cause the meaning of things, or our interpretation of them, to change. (Ref. 17.25) A person experiencing joy is more likely to perceive the world through "rose-colored glasses," and problems become less of a concern. While in a state of joy, a person is more likely to see beauty and goodness in nature and in fellow human beings. There is also a feeling of strength and vigor as well as increased self-confidence. (Ref. 17.26)

The distressed individual is more likely to see the action of others as being harmful. A person experiencing fear has temporary "tunnel vision" because he or she has focused on the frightening object. Therefore our perception of the world, and thus the memories we store, are heavily influenced by our emotions. (Ref. 17.27) Individuals perceive in terms of wants, desires, and purposes; and our wants, desires, and purposes are functions of our emotions. (Ref. 17.28)

Some theorists have argued that emotions play a critical role in the development of both self-awareness and self-identity. (Ref. 17.29) Differential emotion theory states that some emotion is always present in ordinary states of consciousness and is by its very nature a phenomenon of consciousness, constituting one of its basic structures. (Ref. 17.30) Each discrete emotion has a particular influence upon consciousness. Shame, for example, tends to heighten self-consciousness. (Ref. 17.31)

The emotions system is seen as the primary provider of blueprints for cognition, decision, and action. Emotional triggers can be either inborn or learned. (Ref. 17.32)

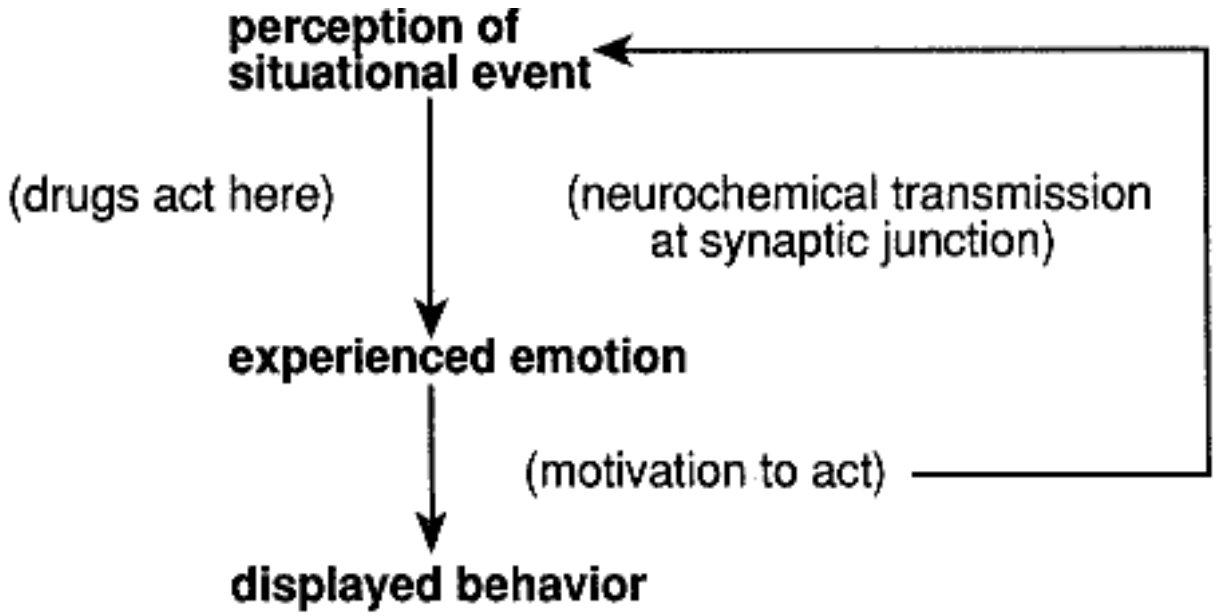
Emotional cues foster intuitive knowing. Emotion and cognition may act in harmony or opposition. (Ref. 17.33) The importance of cognition in motivation and behavior (via emotion-cognition interaction) can hardly be overestimated. After an emotion has been initiated the cognitive system quickly comes into play, and then the cognitive processes such as memory and imagination may often result in further emotion activation. The emotion and cognitive systems therefore have a reciprocal relationship. The motor and emotional systems interact with each other similarly. For example, fatigue may lower the threshold of negative emotions and relaxation may raise them. (Ref. 17.34)

Biochemistry and psychopharmacology have demonstrated the importance of hormones and neurohumors in emotional processes and emotion-related behaviors, (Ref. 17.35) the latter referring to any activity of an organism as a whole that follows or is influenced by one of the major classes of motivation, including drives and emotions. (Ref. 17.36)

Neurochemists have now discovered about 50 chemicals which alter mood and perception. They can make one happy, sad, sexy, suicidal, obsessed or schizophrenic. The molecular structure of some of these chemicals is known, as are the genes that contain their blueprint. (Ref. 17.37) These chemicals all appear to produce their effect at the synaptic junction. (Ref. 17.38) Even though only 50 chemicals so far have been isolated, there are probably in excess of 100 neurotransmitters, precursor enzymes and metabolizing enzymes, all working competitively at the synapses to alter our feelings and perceptions. (Ref. 17.39) According to Hooper and Teresi, "[T]here is no such thing as a chemical-free reality." The human brain both manufactures and then uses drugs that are constantly changing one's perception of reality. (Ref. 17.40) This is yet another example of how matter-energy perturbs intelligence.

Any situational event that occurs in one's life results in a perception of that event, which in turn results in the release of neurochemical

transmitters that cause a particular emotion or emotions. The emotion or feeling then acts to motivate us toward a displayed behavior. This can be diagrammed as follows:



Outside physical forces are continually perturbing intelligence as previously suggested, thus demonstrating their interrelationship and constant interplay.

There is data based on an evaluation of 4,000 psychiatric patients which would indicate that our moods, feelings and behavior are also influenced by external physical stimuli. The study suggested that what is going on within us has an interrelationship with lunar and solar cycles. Psychotic patients are most pathological during a full moon in the summer or fall. Most suicides occur in spring and fall. People who are vulnerable to motion sickness have greater mood swings in spring and fall. Mood swings may be caused by some combination of changing light cycle, gravitational or electromagnetic field fluctuations, as well as other physical influences. (Ref. 17.41)

The emotions system plays a large role in the memory-recording process. The greater the intensity of any emotion experienced at the time of any event, the stronger the memory-encoding process and the easier the memory can be recalled to consciousness at will. Intense happiness or sadness, mild intoxication, lack of sleep, as well as other things, will influence both what is remembered and when and how it is recalled. Extreme elation will produce a stronger memory than mild happiness. If a person is exposed to information while in a specific mood, that information will more likely be remembered when the person returns to that same mood. (Ref. 17.42)

There would appear to be other factors that also enter into the brain's ability to store and retrieve memories, such as having an adequate supply of various neuropeptides, including many of the same basic molecules which are involved in the emotions system. Any lack of certain neuropeptides will restrict memory function.

Diet would seem to play a role in determining an individual's intelligence level and memory capacity. Mentally retarded children were given 11 vitamins and eight minerals over an eight-month period, resulting in an average IQ increase of about 16 points, compared to a mean gain of 1.1 points in a control group. (Ref. 17.43) This is yet another example of how important, and indeed necessary, specific types of matter are for the basic operation of intelligence, and how a strong interdependence exists between matter and intelligence.

Certain neuropeptides appear to be more important than others in the memory storage process. Vasopressin is a neuropeptide that was found to triple the memory span of mice. One of its analogs, DDAVP, has been shown to increase memory capacity in both normal humans as well as victims of Alzheimer's disease. Arousal results in the release of various neuropeptides that appear to act as memory fixatives. (Ref. 17.44)

Patients with Alzheimer's disease have been shown to benefit following the administration of acetylcholine-like drugs. Many will experience improved learning and memory. Even those patients who are severely demented to the point that they cannot dress themselves may improve to the point of resuming some ordinary activity. (Ref. 17.45)

There are at least three basic theories as to how memories are encoded in the brain. Neural theories are based on the concept that there is an actual anatomical alteration of brain cells as a memory is encoded. This would seem to be true to the extent that new dendritic connections are formed and synaptic junction alterations are sustained as a memory is processed. There are biochemical theories based on apparent changes which occur in cellular molecular structures. Electrical theories have also been advanced which suggest that memories are recorded based on changes in the brain's electrical field. (Ref. 17.46) It is quite probable that all three play some part in the memory storage process.

Some claim there is evidence that memory of early childhood and even birth experiences is apparently stored in the unconscious. This has been suggested through the hypnosis of children as verified by their mothers' detailed recollections--also obtained by hypnosis--as well as by comparing detailed birth records with the memories of birth experiences. According to some researchers, the suggestion that the child's memories really come from the mother in the form of hints and other bits of information given over the years fails to account for the extremely personal feelings and thoughts, and their detailed descriptions, that are characteristic of birth reports. (Ref. 17.47) There are others who remain skeptical and believe that this concept has not withstood scientific scrutiny.

According to Stuart Zola Morgan of the University of California at San Diego, and others, the hippocampus is strongly involved in the storage

and processing of memory. This view is supported by evidence that the hippocampus and neighboring brain structures are thought to be involved in the control of emotions. The limbic system, which is well developed in all mammals as well as in the human brain, also appears to be involved with emotional experiences and expression. Therefore mammals would seem to have the required neurological equipment for the experiencing of emotion. (Ref. 17.48)

Both positive and negative emotions, in addition to drives, have aided the evolution of intelligence in the direction of increasing complexity. All drives and emotions result in various forms of behavior. Certain behaviors facilitate the survival of an organism, and others are counterproductive and ultimately lead to death. Those behaviors which facilitate survival are filtered out through natural selection and are kept, and become either inbred through genetic programming--therefore becoming automatic behavioral programs--or are learned when taught by one generation to the next. There are many examples of both throughout the animal kingdom. The positive emotion of interest results in the behaviors of investigation, exploration, experimentation and learning, as well as cognitive development.

Emotional states that are focused can be a prerequisite for analytical, critical, logical and rational processes. Specific emotions have also been identified to coexist with altered states. (Ref. 17.49)

Lorenz has concluded that the mind-brain complex of various animal species, including man, have certain innate properties--such as curiosity and exploratory behavior--which create motivation. He believes that curiosity and exploratory behavior are internally generated and are unrelated to genes, experience or learning. Exploratory behavior is self-motivated learning, and is similar to the drive to pursue research that certain scientists have. (Ref. 17.50) One might say that his concept of curiosity is synonymous with the emotion of interest. Both curiosity and

interest, as defined by Lorenz and Izard respectively, lead to the motivated behavior of exploration and learning. Either would provide the "fuel" that helps drive the evolutionary machinery in the direction of increasing complexity and greater intelligence.

The emotion of joy facilitates creativity and social responsiveness since both tend to produce this desirable feeling. The negative emotion of distress promotes remedial strategies and problem-solving as well as creativity. The negative emotion of shame stimulates social responsibility and self-improvement when properly dealt with. Anger when directed constructively can prove to be a source of strength and courage, and supplements the basic survival instinct. Fear provides motivation for avoiding dangerous and survival-threatening situations. (Ref. 17.51) It has resulted in the evolution of a large multitude of fight-or-flight behaviors within the animal world. Cats hump their backs and hiss, chickens flap their wings, some animals stay motionless, and others run. The more intelligent behaviors, whether learned or inbred, have the greatest statistical chance of survival within any species. By definition, any behavior that is selected out and maintained within any species, thus enhancing its chance of survival, is a more intelligent behavioral pattern than one that is eradicated because it is maladaptive.

Emotional responsiveness affects personality characteristics and social development of an individual as well as intelligence level. The person who is distressed much of the time will be less inclined to explore and manipulate the environment than the person who has a low threshold for interest and enjoyment. The emotion of interest is essential to the enhancement of intellectual development. (Ref. 17.52) Experiments with rats have repeatedly shown greater intellectual development when they have been raised in an enriched state, which has stimulated their interest, rather than in an impoverished one.

The emotions play a vital role within each organism as part of its overall intelligence system. They have an established role in processing memory, impacting perception, promoting the instinct for survival and motivating behavior.

Anyone who accepts the premise that nature displays purposiveness would be likely to see the emotions system as an attempt on the part of intelligence to provide motivation to each organism, both for its own enhancement and for the group or society that it lives within. Our emotions system seems to be designed in such a fashion that, when working properly, it promotes organismic behavior which is balanced between the welfare needs of the individual and those of its society.

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Chapter 18

Drives -- Cause and Effect Relationships With Intelligence

(16) The presence of drives is a property of intelligence at all levels, but is best appreciated in higher life forms.

An instinctual drive or motive has been defined as an appetitive internal or intrapsychic force that is (a) peremptory, (b) cyclic, (c) selective, (d) displaceable. An instinctual drive is also characterized by its ability to exert pressure or force resulting in physical work performed. The aim of any drive is the discharging of energy and the achievement of satisfaction. (Ref. 18.1)

The drive system is activated by tissue changes and deficits that create signals and provide information about bodily needs. The most common drives are hunger, thirst, fatigue, sex, pain-avoidance and pleasure-seeking. Drives are important to assure survival of the individual and the species. (Ref. 18.2)

Pleasure-seeking and pain-avoidance have been identified as two of our several drives. Both have also been referred to as "physical feelings." (Ref. 18.3) They are seen to have the function of promoting survival-oriented behavior. (Ref. 18.4) Emotions, like pleasure and pain, likewise provide a source of guidance for our actions by affecting behavior in the same ways as do the physical feelings. (Ref. 18.5)

All animals and plants possess drives that largely determine their behavior. Most if not all animals also possess emotions. In simple organisms it is impossible for us to distinguish drives from emotions. Whether a bacterium seeks nourishment because it is compelled to do so based on an inherent drive or because it desires to do so can only be speculated upon.

Two of the drives that animals possess are pleasure-seeking and pain-avoidance. We as humans are motivated (driven) to move about in space on the basis of the seeking of pleasure or the avoidance of pain. This is a neurochemically controlled phenomenon. Certain cells in the brain release endorphins which result in our experiencing pleasure. This is so desirable that it compels or drives us to continuously and actively pursue pleasure. People can become addicted to certain chemicals (alcohol, cocaine, marijuana, valium, etc.) because the effect of the substance can be so pleasurable, at least initially, that we are driven to use it many times beyond our control. Rats will voluntarily kill themselves seeking a continued infusion of cocaine. The pleasure they derive is so intense that they will push themselves uncontrollably past death to achieve the euphoric feeling.

Emotions differ from drives in several respects. The emotions system has certain freedoms not characteristic of the drive system. Emotions display freedom from time--there is no essential rhythm or cycle as with the drives. Emotions have freedom from progressively increasing intensity, whereas drives characteristically increase in intensity until they are satisfied. The intensity curve of an emotion may vary substantially in time. Emotion has considerable freedom in the density with which it is invested. The density of emotion is the product of intensity and duration. (Ref. 18.6) There is considerable freedom in the way that emotions may be instigated and reduced. Most people strive to maximize positive emotions and minimize negative ones. (Ref. 18.7)

Emotions also have great freedom with respect to goal-orientation, whereas drives as motives are quite specific. (Ref. 18.8) Emotions influence and regulate the drives by amplification or attenuation. (Ref. 18.9) Emotions differ from the physical feelings of pain and pleasure since they can be triggered by a much wider range of stimuli or events. Emotions can actually be triggered by pain and pleasure themselves.

Emotions also differ from the physical feelings in that their experience and expression are very much dependent upon learning, whereas physical feelings are much more innate. (Ref. 18.10) Emotions are also innate to the extent that they are an essential aspect of human nature. Virtually everyone experiences the same kinds of emotions regardless of the culture, and they are expressed in universally recognizable ways. (Ref. 18.11)

Both emotional and physical feelings, or drives, are produced by a neurochemical mechanism, and emotions represent a powerful extension of the guidance provided by pain and pleasure. (Ref. 18.12)

The drives found in all organisms have been selected out through evolution because they resulted in survival-oriented behavior. Any drive that is counterproductive to survival will be erased through natural selection. Drives as well as emotions are an important part of the intelligence system and can tell matter (our bodies) to move in various directions as the matter-energy side of nature interfaces with intelligence. The purposiveness inherent in nature is largely manifested through the drive and emotions systems.

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Chapter 19

Disease -- Failure of Intelligence

(17) All disease is the result of a partial failure within the intelligence system of any organism. Although there are many different pathological disease processes that can affect the body (infection, malignancy, degenerative disease, etc.) they all have a common denominator--a failure of the intelligence system at some level. The origin of a disease process can occur in many different ways, which are best appreciated by the study of human medicine.

Although virtually all organs in the body play some role in the repelling of disease, the major defense mechanism is the immune system, which represents that part of the intelligence network charged with the responsibility of fighting off invading microorganisms that threaten any host organism. It is an extremely elaborate system which is strongly influenced by the brain.

Psychoneuroimmunology is a field which studies the immune system and how it relates to the brain. Researchers have determined that the brain at least partially controls the immune system via neurochemical communication. It can send out signals along nerves and it can pump out neuropeptides, both of which direct the immune system to aggressively fight off disease. The brain and immune system form a closed circuit, with the latter being capable of communicating back to the brain via chemical messengers. (Ref. 19.1)

It has been determined that the nerves release chemical neurotransmitters which attach themselves onto immune cells and alter the latter's ability to reproduce and to kill invading organisms. The brain also regulates the release of various hormones that affect the immune cells' ability to fight disease. (Ref. 19.2)

As organisms experience emotions, neuropeptides are released by the brain, primarily from the limbic system, and they stimulate immune cells and influence the way that macrophages fight disease. (Ref. 19.3) It is through the emotions system that stress and affectivity influence the immune system's ability to function.

Hugo Besedovsky at the Swiss Research Institute has discovered that the brain keeps track of immunological activity and uses this information to help direct it. When macrophages and lymphocytes encounter viruses and bacteria, they both attack them and send chemical messages through the blood back to the brain. These signals inform the brain that certain hormones need to be produced which either increase or decrease the activity of immune cells. (Ref. 19.4) When a macrophage encounters a microorganism, it performs the purposeful action of extending a pseudopod and ensnaring it. (Ref. 19.5) It then destroys it by digesting and metabolizing its materials.

The immune system has a memory as part of the intelligence network. Lymphocytes remember encounters with various microorganisms, just as the brain stores information about experiences, and thus they can defeat them more easily when the body is attacked in the future. It has been observed that the two types of memory age in parallel fashion. They both reach their peak during puberty and fade during older age. (Ref. 19.6)

There is no longer any doubt that the immune system is primarily under the control of the unconscious mind functioning as part of the intelligence network.

Every atom and molecule in the body of an organism has a physical half-life and every cell a biological half-life. They are all undergoing disintegration at an exponential rate which generates a need for repair. At the atomic level electrons are being forced out of orbit, which alters the atoms' energy state, and complex molecules break apart into smaller products which if not replaced could result in irreversible damage to a cell, resulting in its death. Too many cells dying simultaneously will result in the death of the organ and eventually the organism.

In opposition to this physical and biological entropic process, every cell, and perhaps even all molecules, have a built-in instinct for survival. Each cell basically knows what it requires for survival because the concept is programmed into its information system. Each cell is continuously "looking for" the basic electrons, atoms, molecules, etc., it needs for its own self-preservation. It must replace those vital parts (basic atomic structures) that ultimately become lost during the "normal entropic" process. The body is in a state of relative equilibrium all of the time that it is alive; and the body is constantly in a state of decay and also in an opposing state of repair. It is undergoing entropy as the result of many different environmental causes, including exposure to cosmic radiation, exposure to viruses, bacteria, parasites, states of oxygen deficiency, ingested poisons, carcinogens, drugs, etc., with the list being almost endless. Chemical bonds broken by radiation may result in a weakness of a cell wall, which allows a natural toxin to enter.

A combination of chance events could begin a chain reaction of seemingly otherwise repairable insults that bring widespread damage to the organism. Most of the time the intelligence system thwarts the insult through the immune system, and excretory organs such as the liver,

kidneys, lungs, and other organ systems. An invasion of the body by a virus is counteracted by the immune system; ingestion of alcohol is counteracted by the liver; overhydration or underhydration by the kidneys; too much sugar ingestion by the pancreas secreting insulin; and there are many other insult-controlling mechanisms as well. All of the processes are directly under the control of a part of the intelligence system.

Intelligence interfaces with living tissue at all levels of existence. If a brain infarct (stroke) occurs, this precludes a portion of the brain matter from interfacing with intelligence. In similar fashion, any disease that damages the kidney will reduce its ability to interface with the intelligence system. Toxic chemical agents or viruses might produce minor damage to the microanatomy of the kidney, making it more susceptible to streptococcus infection and glomerulonephritis, with resulting greater cellular destruction. If the destructive process continues, there is a further reduction in the ability of the intelligence system to interface with the material form of the kidney, and then uremia and death of the kidney may follow. Because of the mutual interdependency of all body organs, renal failure will soon result in demise of all other organ systems and hence the entire organism. It is presumed that all organs in the body are in constant communication with each other through the production and liberation of chemical messengers. Whatever affects one organ will either directly or indirectly affect all others.

Intelligence could in part be defined on a basic level as an organism's overall ability to survive. An organism whose entire intelligence system continually makes the "correct" choices because it is "smarter," will live longer than one that doesn't. Intelligence began to be selected out in the most primitive of living structures as each one began recognizing those sorts of basic ingredients it required for survival. If the simplest molecule that could reproduce itself required certain atoms or molecular

groupings to survive, it would automatically pick those atomic particles out of its environment when they became accessible. If an atom is unstable because it is minus an electron, it will pull one out of the surrounding space as soon as one passes close enough to capture. If a DNA molecule is constructing a protein, it will grab the essential amino acids, purines, pyrimidines or nucleotides as they get close enough in space to capture, thus completing the task at hand. If there are other molecules floating around which are similar enough in their anatomic makeup to substitute for the desired molecule, a destructive effect could potentially occur.

The intelligence system is continually trying to repair all the insults that the body is encountering. This system will try every way possible to combat a cell gone cancerous, just as a DNA molecule will attempt to repair itself if a part of its vital structure is damaged by a highly energetic gamma ray passing through it. Too much gamma radiation at any one time could result in multiple DNA molecules being damaged. This might lead to weakening the DNA molecule enough to result in further widespread damage of that cell, perhaps just enough to result in a malignant transformation. An avalanche effect could conceivably result, eventually causing the death of the organism.

Aging, as well as disease, is the result of the organism's interaction with its environment, reflecting the process of entropy. An organism is continuously being bombarded with all kinds of natural toxic substances, infectious agents, parasites, radiation and physical forces.

Intelligence was selected out when basic molecular structures, which could reproduce themselves as they became better competitors with other molecules, evolved better ways to survive destruction by making "better choices." This mechanism for making right choices has become infinitely more complex during the evolutionary process.

Basic physical principles influence every reproducing structure, no matter how simple or complex it might be. Intelligence writes the script and natural selection acts as the editor by selecting out those mechanisms which allow the structure's survival. Intelligence evolved because of the basic instinct for survival programmed into every reproducible structure, thereby resulting in purposeful action. The more intelligent an organism became in its ability to recognize harmful events and to avoid them by whatever means it could (immune system, etc.), the longer it could survive. Increased survival time translates to greater reproduction capabilities. This was the underlying driving force that aided the evolution of intelligence into states of greater complexity.

The entropic process, both physical and biological, results in disintegration of matter, whether living or non-living, and is the ultimate underlying cause of all disease, in combination with the failure of the intelligence system. In this sense, entropy can be considered to represent anti-intelligence.

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Chapter 20

Intelligence As a Universal Phenomenon

(18) Intelligence is a universal phenomenon and is present wherever matter and energy exist. As of yet no proof exists that there is organic-related intelligence anywhere else within the universe beyond earth, yet it would seem highly probable that there must be. Even without proof, most scientists appear to accept this concept without much hesitation. Proof awaits the unequivocal discovery of extraterrestrial life.

Evidence that extraterrestrial life may exist is beginning to surface. The book Evolution From Space, by Fred Hoyle and Chandra Wickramasinghe, deals with a theory that life on earth originated from an extraterrestrial source. They argue rather effectively that it is theoretically possible for genetic material to pass through space and seed any planet that is capable of supporting life. They see genes as cosmic and as capable of passing through space as DNA or RNA, as fully-fledged cells, or as viruses or viroids. Although the genes that originated life on earth might have been extraterrestrial in origin, they were assembled in whatever functioning biosystems the environment of the earth would permit. (Ref. 20.1) They suggest that genes are arriving continuously but not necessarily at regular intervals. It has been determined mathematically that genetic material is exactly the right size to ride on the light waves of stars and to do so with the greatest possible efficiency. (Ref. 20.2)

It has also been established that microorganisms can withstand extremely hostile environments and survive. At the Jenner Institute in London they showed that spores of bacteria could be kept for 24 hours at

a temperature of -252 degrees centigrade in liquid hydrogen without losing their germinating power. Additional experimentation also demonstrated that microorganisms may be kept in liquid air at –200 degrees centigrade for six months and still keep their germinating power. (Ref. 20.3) Other microorganisms have been exposed to an ultra-high vacuum nearly the same as that of space for five days with no lethal effect observed. (Ref. 20.4) H. Dombrowski succeeded in isolating and cultivating live bacteria from salt deposits that were laid down approximately 250 million years ago. (Ref. 20.5)

There is also evidence that certain strains of bacteria could be of extraterrestrial origin. Photosynthetic bacteria use free hydrogen or hydrogen sulfide in place of the water which other types of bacteria require. Since free hydrogen and hydrogen sulfide are both rare on earth, it would seem unusual to find bacteria with this requirement unless both were in much greater abundance during early life history, or unless these particular strains developed elsewhere. (Ref. 20.6)

Other arguments are also presented in favor of an extraterrestrial origin for life. However, since they are beyond the scope of the Integrated Theory of Intelligence, the reader is referred to the book by Hoyle and Wickramasinghe for additional information.

In his more recent book, The Intelligent Universe, Fred Hoyle also cites evidence that meteorites could have brought microorganisms to earth from outer space. Both virus-like and bacteria-like fossils were found inside a meteorite discovered in 1969 near Murchison, Virginia. (Ref. 20.7)

There are basically two kinds of meteorites, stony and iron. Some stony meteorites contain small glass spheres called chondrules embedded in their matrix. These chondrules have been found to contain a significant quantity of carbon, crystallized water and amino acids. It has been

proven that the amino acids are not contaminants from earth since both dextro and levo forms exist in the meteorites, and only the dextro forms are present here on earth. (Ref. 20.8)

Fred Sisler of the U.S. Geological Survey collected samples from the interior of carbonaceous chondrite meteorites and found that, after a long period of time under sterile conditions, some of the nutrient broths derived from these samples clouded over, thus indicating the presence of living microorganisms. At least one of these roused organisms is totally unfamiliar to terrestrial microbiologists. (Ref. 20.9)

It has also been determined that about 0.1% of all material which has ever fallen to the earth is organic. This is one million times more organic than earth itself, since only 0.0000001% of earth's mass is organic. Therefore the concentration of organic material in meteorites is much greater than here on our planet. (Ref. 20.10) This is evidence that those organic compounds precisely necessary for the initiation of life on earth could have been imported here from elsewhere. (Ref. 20.11)

It would also appear likely that for life to become established here on earth, a whole mass of protocells would have had to arrive at the same time, both because of expected attrition (Ref. 20.12) and also because of a certain interdependency which they might have had. The continuation of life appears to require some organisms surviving at the expense of others. The surviving protocells would have incorporated the break-down products of the dying protocells, thus beginning the process of natural selection.

Much of the material contained within all forms of life consists of cosmic trace elements that originated within stars. During their lifetime, certain stars transform hydrogen to helium and eventually form heavy chemical elements which are discharged into space if the star becomes a

supernova. Our bodies, therefore, are constructed of fossilized debris originating within stars. (Ref. 20.13)

Inorganic-related intelligence is diffusely and unevenly distributed throughout space, and is more concentrated in those areas containing matter-energy. Organic-related intelligence would also appear to be universal in origin. However, it still lacks the "smoking gun" proof that might someday be provided if and when contact with an alien civilization is achieved.

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Chapter 21
Information -- Continued States of Increasing Complexity

(19) Information content throughout the universe is continuing to evolve toward states of increasing complexity. It was erroneously concluded at one time that the entropic process is causing a state of universal decay that results in higher, more complex structures disintegrating into simpler forms. This concept resulted through a misinterpretation of the second law of thermodynamics. Entropy is occurring, as has been recognized. However, in spite of this, matter continues to take on more complex forms with an overall net gain of information. Most systems are changing toward states of greater order. A star is much more ordered than the hydrogen cloud from which it came. In the May 1985 issue of Scientific American, Nobel prize winner Hans Bethe stated that, "The entire evolution of the star is toward a condition of greater order." Through gravitational attraction, there is a condensation of hydrogen, a conversion of hydrogen to helium through nuclear fusion, and then a formation of larger, more complex, heavier elements from helium.

Order, along with continually increasing amounts of information, also occurs during the evolution of a planet. Earth probably formed from a cloud of gas and dust undergoing accretion, which resulted in a very hot metallic core, a mantle, and a continental crust of lighter material floating at the surface. This process of increasing order continues with the development of a high degree of chemical and physical order at the surface.

Information is diffusely present throughout the entire universe. Every congregation of matter in existence, even the most simple grain of sand, contains stored information. The planets, stars and galaxies have tremendous amounts of stored information, including complex organic molecules. The distribution of information is uneven, with earth manifesting a localized concentration of it. The distribution of intelligence as we perceive it in our reality would appear to be concentrated into those locations where matter has achieved high degrees of complexity and stored information, such as here on this planet.

As the information content within any system increases, which is directly related to its level of complexity, so does the level of cumulative total intelligence, and of consciousness. Higher levels of consciousness require more complex arrangements of matter-energy with an overall greater amount of stored information.

Many physicists believe that they could be close to developing a complete theory of the universe, including its origin. Until now only four basic forces have been identified, including gravity, electromagnetism, and the strong and weak nuclear forces. The present-day conception is that initially, at the origin of our universe, there was one superforce which gave birth to the others. This superforce would also represent an amalgamation of matter-energy and space-time, and would create the perception of a universe of unsuspected unity. (Ref. 21.1) The four or more surviving forces left over from the original superforce are now viewed as nature's attempt to maintain various abstract symmetries in the world. (Ref. 21.2) As previously indicated, these forces are thought to be directed by intelligence.

In the beginning, it would appear that the universe was a featureless ferment of quantum energy which suddenly burst forth in a state of rapid expansion. It was only then that energy began to congeal into matter

and, one by one, the four fundamental forces separated out from the superforce. It also represented the beginning of space-time. (Ref. 21.3)

The evolution of intelligence, from the standpoint of how it manifests itself relative to matter-energy (brain, body), did require the expansion of space. Prior to the big bang, matter- energy would have been compressed into a small volume of space and would have been too chaotic to form complex molecules. Quantum particle motions would have been too extremely energetic to allow atoms to come together to form even small, simple molecules, let alone complex ones. As the universe expanded, energy was allowed to dissipate, and atoms and molecules could congeal together to form units of increasing complexity. None of this could have happened prior to the expansion of space. The more open space that matter-energy has to move around in, the greater the statistical probability that it will congeal into more organized complex states with higher information content. This is based in principle on the similar concept contained in Boyle's and Charles' laws. If a gas is held within a container, such as a piston, where the volume of the container can be increased, then there will be a drop in temperature and pressure of that gas. Under the right conditions this allows molecules to come together and precipitate out into liquid form. In similar fashion, energy could not congeal into matter in the very early universe prior to sufficient spatial expansion, because the energy level was much too high to allow for molecular stability. As the universe has undergone spatial expansion, more complex forms have been possible with higher information content. The expansion of space has allowed "order out of chaos" to occur.

Entropy is occurring, but is doing so in the sense that energy is being lost to surrounding space in the form of heat, electromagnetic radiation or atomic particles. Complex structures are breaking down into smaller simpler forms. However, this phenomenon is being overridden by the opposing process that is producing systems of increasing complexity.

In the past, arguments have been presented that molecules complex enough to be life-forming and life-sustaining could not have randomly formed, because higher-order molecules were continually undergoing an entropic process and breaking down to simpler atoms and molecules. The apparent fact is that there must be a universal pressure causing more complex structures to form from simpler ones, and this would have aided the origin of life forms.

As the expansion of space continues, it will allow the formation of material structures with increasingly higher levels of total information content, and this in turn will result in higher levels of intelligence and consciousness.

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Chapter 22

Five Other Properties of Intelligence

20) Intelligence appears to manifest a process of self- generating complexity as an inherent basic property. As a force in opposition to the entropic process, intelligence has resulted in the earth becoming more complex and richer in information. Intelligence seems to manifest an inherent, instinctual drive that produces a positive pressure, resulting in the evolution of most systems in the direction of increasing complexity. This principle is operating in life forms, stars, planets and galaxies as well. The entire universe appears to be in a continual process of evolving into a state of greater complexity.

Ilya Prigogine, a Nobel Prize winner for chemistry in 1977, has recognized this phenomenon and developed his "Theory of Dissipative Structures" around it. (Ref. 22.1) He believes that open systems have a tendency to move forward toward a more highly organized state rather than backward toward a simpler state. He sees these more highly organized states as highly improbable on a basis of chance and without some type of organizing principle driving them in the direction of increasing complexity. (Ref. 22.2) Prigogine believes that open systems begin in a state of disorder, become unstable, and then enter a stage in which energy accumulates and structure develops through a series of fluctuations. (Ref. 22.3)

He describes a fluctuation as representing a chance occurrence deviating from average behavior, which can either be smoothed out or under special circumstances can grow larger and become established. If a fluctuation reaches a critical size and becomes too great for the system

to absorb, it will be forced to reorganize in an equifinal state of greater complexity. (Ref. 22.4) The system then manifests higher integration and connectedness along with greater energy flow-through.

Each level of reorganization is more complex than the preceding one and becomes increasingly vulnerable to additional fluctuations and reordering. This process creates a condition for an accelerated evolutionary development, and would help explain the non-linear upward evolution of intelligence. Prigogine has developed mathematical formulas which attempt to show that the greater the complexity of the system, the more flexible it becomes in its ability to readapt to change and new circumstances. (Ref. 22.5)

Louise Young also recognizes this natural tendency for self- organized wholes to form or regenerate when disturbed. She believes this process applies not only to living matter but to inorganic matter as well, including atomic structures, the earth, stars and galaxies. (Ref. 22.6) She states that, "Each self-organized unit possesses the innate tendency to preserve and extend its own existence, thus increasing the total amount of Form as measured in space and time." (Ref. 22.7)

There simply can be no question that the evolutionary process could not have occurred without some underlying force propelling it forward. Such a force is required to overcome the other natural tendency for the universe to undergo entropy. Without this opposing force the entropic process would preclude the formation of complex structures.

(21) The more intelligent any individual organism becomes, the greater its chance of survival relative to members of its own species as well as to all other animal and plant life in general. This is a statistical phenomenon only. It doesn't guarantee that the organism will outlast other life forms, but it does give it a slightly greater chance

(competitive edge). There are a great number of animal functions that have evolved and allow for an increased chance for survival. The faster an animal runs; the better it sees, smells, hears, etc.; the greater its chance of survival, thus allowing its eventual reproduction.

The lack of acquisition, or the loss of, certain physical and sensory abilities in prehumans aided the upward evolution of cognitive intelligence. As certain prehuman primates became lacking in some of the physical qualities that had aided others in their ability to survive through natural selection, the resulting pressure selected out the more intelligent. In other words, as ape-like animals became lacking in their ability to run fast, climb trees and swing from branches, thus avoiding their enemies (predators), this had the potential effect of selecting out the more intelligent animals of their species. If this had not occurred, there would have been less pressure to drive intelligence upwards. If intelligence had not increased in our prehuman and human ancestors, man would not be in existence now.

When we compare some of our motor and sensory abilities to those of the rest of the animal kingdom, we find that we fall short in a number of ways. Comparatively speaking, we run more slowly than many animals, our ability to smell is relatively weak and we don't see as well in the dark as some. Many animals are superior to us in certain ways. Bats have radar, dolphins have sonar, dogs have a much keener sense of smell and hearing, cats react more quickly with better coordination, owls see much better in the dark, arthropods are many times stronger per unit of body weight. In other words, if our intelligence had not increased proportionately to the lack of development or loss of other physical and sensory systems that other prehuman primates had, the physical animal man in his present physical form probably could not have survived. Man in his present body with only the intelligence of a monkey would have been relatively easy prey for certain larger animals.

The organisms which are preprogrammed to cope with a greater number of possible unpredictable eventualities will be the survivors. The greater the preprogramming of the organism with relevant meaningful information, the greater its intelligence, by definition, and the greater its chance (statistically) of survival.

This at least in part helps to explain the proposed concept of self-generating complexity that others have postulated, since the result of the process has been an upward pressure for increasing intelligence throughout the animal and plant world. The competition of organisms for survival has been a positive force driving life forms in the direction of increasing complexity. All species of animals and plants are constantly adapting and finding new and creative ways of competing against each other for survival. This is an automatic evolutionary process motivated by each organism's basic instinct for survival.

More complex life forms with higher overall intelligence tend to prey on lesser life forms for food and survival. In general, the more complex an animal is, the more intelligent it will be, and the more likely that it will be predator rather than prey. This same phenomenon exists on a microscopic scale down to the simplest of life forms. There are obvious exceptions, i.e., viruses prey on other life forms by invading existing animal or plant cells, stealing nutrient, and overtaking their normal directive mechanisms.

The evolution of intelligence began very slowly but has been accelerating with time. It evolved slowly because the competitive edge given to any single organism was only very slight.

An organism's IQ could be thought of as a measure of its overall ability to compete successfully for survival. It reflects the total amount of preprogrammed information and learning potential that an organism

possesses, and which aids in its adaptation to unpredictable eventualities.

This property of self-generating complexity that intelligence seems to possess is very much dependent upon the ability of an organism to pass on to its offspring any increased information. This does occur in all animals and plants, just as faster-running thoroughbred horses can be selectively bred. It has been adequately shown that highly intelligent parents will have a statistically greater chance of conceiving children who likewise are above average in intelligence. This in fact is accomplished by the genes, which carry the blueprint for an organism's intelligence system.

If through chance mutation an organism is born more intelligent than its parent, this increased intelligence will be passed on to some of its offspring if it survives long enough to reproduce. Not all of its offspring will be endowed with the higher level of intelligence, and those who don't inherit it will be at greater risk relative to competition for survival. This produces a positive pressure that gradually forces the upward evolution of intelligence.

It seems reasonable to conclude that any present-day organism would be intellectually superior to its ancestors in a variety of ways. As all life forms evolve, competition for survival should become more intense at all levels of existence, thus resulting in the need for still greater increases in complexity. If the principles of evolving intelligence hold true, then it stands to reason that they should apply universally to all life forms. This phenomenon would be very difficult if not impossible to determine. For example, there is no way to accurately judge a prehistoric animal's intelligence level. Comparing relative cranial size gives only a rough approximation of intelligence. Prehistoric horses have skeletons which are as different from present-day horses as those of prehuman primates are compared to man. We still call them horses, but were they

as intelligent? Prehuman primates certainly were not as intelligent as present-day man.

The early intelligence systems, and those in simple life forms of today, are basically automatic response machines with very little adaptive learning mechanism. Their intelligence systems react automatically to virtually all environmental challenges. Great as the difference is between simple life forms and man, there is still one common denominator, the "instinct for survival." Its extreme importance must not be underestimated as a main source of positive pressure for the upward evolution of intelligence.

(22) Intelligence would appear to require a life cycle (fertilization to adulthood) to direct its spatial concentration. Whatever level of intelligence is achieved in any organism is very much dependent upon the total overall spatial arrangements of all molecules within the organism, and particularly those of the central nervous system. It would appear that any organism can only reach its maximum intellectual potential if matter is allowed to undergo the normal process of accretion which occurs during growth of the organism. Any process which interferes with normal neurological growth will reduce the anticipated level of intelligence in that organism. The life process, beginning on a molecular level within single cells (sperm and ovum), has an intellectual level potential that may or may not be achieved, depending upon whether normal development occurs or is interrupted along the way. If development occurs normally, the growth process results in the effective concentration of intelligence into a confined space via molecular accretion.

It is uncertain as to whether intelligence is actively guiding the atoms and molecules into specific complex configurations or arrangements, or is simply the recipient or beneficiary of some innate internal pressure of self-generating complexity. In either case, increasing amounts of

intelligence and consciousness, as they relate to our present existence, require increasingly complex arrangements of atoms and molecules.

The gene holds the blueprint for the construction of the organism and the way that matter-energy is spatially organized. The genes working in tandem oversee and orchestrate the life cycle of the intelligence accretion process. There is no one element in the human mind (brain) which is aware or conscious by itself, just as no one atom or enzyme in a cell is alive by itself. Yet when those atoms are brought together in an exquisitely ordered pattern we get a high level of consciousness. It is the very special way in which the atoms and molecules are ordered within our brain which helps create mind. We have divided the brain into gross anatomical structures such as the cerebral cortex, thalamus, brainstem nuclei, etc., but the brain viewed on an atomic level would not recognize these boundaries. All atomic events happening anywhere within the brain would potentially influence all other areas, just as it has been previously suggested that even distant cosmic events would influence the brain's function. As dictated by the inverse square law, local atomic events within the brain would influence other areas of the brain to a much greater extent than distant cosmic events.

(23) Intelligence, like matter and energy, cannot be destroyed. We don't as yet know what happens to intelligence upon the death of an organism. However, as one of the basic properties of the universe it is considered very probable that intelligence can neither be created nor destroyed. The level of complexity of intelligence may vary extremely from its simplest to most complex manifestation, but even at the death of an organism the total amount of information accumulated by that organism will be preserved. It may become disorganized and dispersed, but not lost. At the death of an organism, its system's intelligence either remains focused or it becomes dispersed in space. If intelligence is more a property of matter it will disperse. If intelligence is more a basic

property of space it could remain focused or intact. At the present moment in time, science is unable to make this determination.

(24) Intelligence will be influenced by relativistic principles as are matter-energy and space-time. Relativistic theory has indicated that space is not three-dimensional and time is not a separate entity. Both are inseparably connected and form a four- dimensional space-time continuum. According to relativistic theory, an outside observer watching an object moving through space would see certain interesting phenomena occur as the object approached the speed of light. The length of the object would appear to shorten, its mass would increase, and its time would slow down. The speeding object, if it were a human, would probably not be aware of the changes. Their perception of their reality would probably be the same as ever, and they would not be aware that the outside observer was witnessing anything different about one's own system. As this human approached the speed of light, the outside observer would see the atomic and molecular events within the human become slower, just as time on the human's own wristwatch would slow.

This theory would predict that as these various events occurred, the function of the human's intelligence would also slow proportionately to the slowing of all of the atomic events. The speeding human's thought processes and body functions would all slow down relative to the outside observer, somewhat analogous to watching a movie in slow motion. Thus, it is predicted that the function of intelligence will be influenced by relativistic principles just as are matter-energy and space-time. This is yet another example of the interdependency, interconnectedness and inseparability of matter-energy, intelligence and space-time.

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Chapter 23

Evolution of Supraconsciousness and Its Impact Upon Lifekind

The Integrated Theory of Intelligence was developed with the intent of establishing certain basic concepts which best approximate our present perception of reality. This is an attempt to lay a theoretical foundation for what has already been referred to by others as the "Ultimate Theory of Everything."

Although the Integrated Theory of Intelligence is somewhat comprehensive in scope, there are certain central core hypotheses which are considered to be of greater significance than others because of their important implications. They would include:

(1) Intelligence (consciousness) exists and forms one of the five basic ingredients of our reality along with matter, energy, space and time.

(2) Intelligence has evolved, taking on forms of increasing complexity, beginning at the origin of the universe.

(3) Intelligence will continue to evolve without limit in an expanding universe, attaining states of increasing complexity at its present non-linear rate which would

seem to approximate an exponential curve. Time and observation will eventually allow this hypothesis to be tested. Along with this, humankind, and probably other life forms, are gradually and continuously achieving higher consciousness states.

(4) With increasing intelligence, states of higher consciousness are not only possible but are becoming more and more common within humankind as part of the evolutionary process. This in turn has resulted in a continually more sophisticated comprehension of our reality. The implication of this one concept is awesome. As our ability to learn and to process increasing amounts of new information escalates, our understanding of all of reality will become increasingly more accurate at an exponential rate.

(5) The exponential evolution of intelligence and consciousness is one of the necessary prerequisites for the appearance of a new kind of world social order. There are those individuals who believe that one is already forming in an infant state. It is presently unorganized and leaderless, and to a certain extent is comprised of individuals who have achieved higher states of consciousness. These individuals are undergoing a process of self-actualization which in turn is stimulating a process of society-actualization. Even though this would seem to be happening slowly, it is actually occurring exponentially, which in time will result in unprecedented change and include life

> forms of increasing complexity. Such an outcome is inevitable assuming that humankind is able to keep from destroying itself and the rest of the planet during the interim. This provides a most optimistic scenario for humankind's survival. The evolutionary increase in intelligence has also apparently passed a threshold which now allows humankind to actively and consciously participate in the attainment of higher levels of intelligence and consciousness. This will lead to a continually greater understanding of our reality, as well as a society which is less self-oriented and more group-oriented. Even now, through a self-actualization process, one is much more capable of goal-oriented behavior that unifies both individual and group needs, as based on first-hand knowledge that what is good for society is also good for the individual.

There are now many self-actualizing people who have dedicated themselves to the improvement of humankind. They have come to recognize the interconnectedness of all things, and how every occurrence influences every other occurrence. Abraham Maslow referred to this group as the "growing tip," (Ref. 23.1) and Marilyn Ferguson has called them the "Aquarian Conspiracy." They represent humankind's best hope for eventual survival. Each self-actualizing person is more altruistic and group-oriented. Each has a more urgent need to give for the benefit of others. Many self-actualizing individuals arrived at this state as a result of a peak experience, but this is not necessarily a requirement. A P.E. definitely facilitates the process of

self-actualization, but is not absolutely essential.

Humankind's survival will ultimately be based upon its ability to achieve a more advanced social order. Within the not-too-distant future, if it hasn't already occurred, humankind will develop a weapons technology which could result in the total annihilation of this planet, so that its physical presence ceases to exist. I personally believe that humankind

will continue to undergo an evolutionary process that will allow for higher consciousness states and greater enlightenment, and that this in turn will allow us to override our aggressive nature.

The conception of a new world order is not new. However, until recently it has primarily been considered to represent good science fiction. With Abraham Maslow's identification of self-actualizing people, this concept acquires a greater level of respectability and credibility. A brief description of a self-actualizing person would be important to justify the seemingly overly optimistic claim about their ability to provide a basis for a new order. It should also be emphasized that at this moment in time there are far too few in number for a new order to form. There are, however, enough of them to begin the long, slow process toward that end.

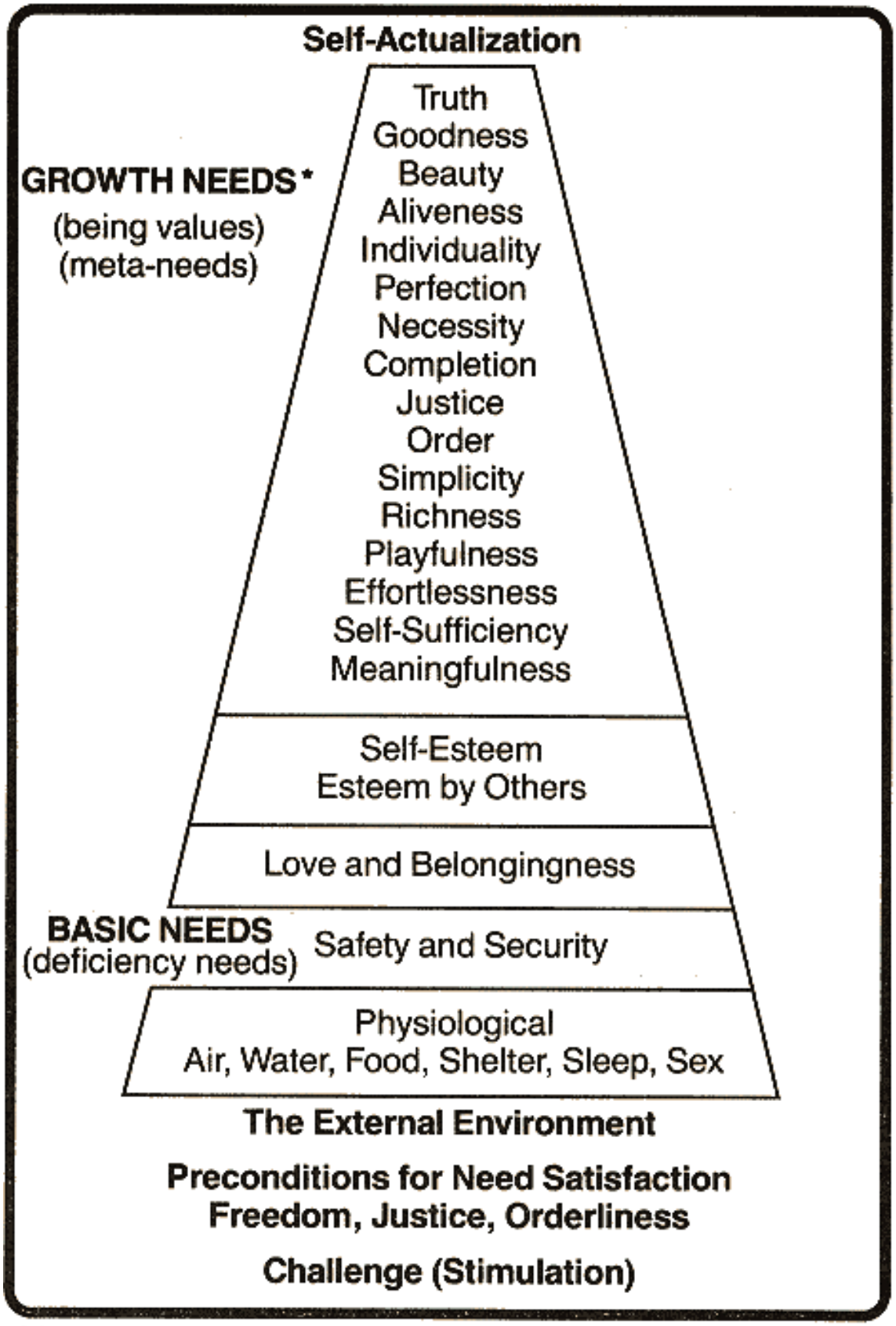
In my perception a self-actualizing person is one who values the acquisition of truth above all else, no matter what the source or cost; who is not unduly motivated by personal gain; who repudiates hostility and aggressiveness; who has a great capacity to feel love for others; who is highly sensitive to their needs; who has a great capacity to understand and forgive human behavior and is at relative peace with the environment and all of existence. For some, these basic personality features are at least in part the result of a peak experience.

The self-actualization process refers to the discovery and development of the whole self, including any preexisting latent potential. (Ref. 23.2) Maslow, after years of studying self-actualizing individuals, described them as the best possible specimen of the human species and referred to them collectively as the "growing tip." They comprise only a fraction of one percent of the human population. (Ref. 23.3)

He also concluded that they have a superior ability to see and interpret life more clearly because of their more accurate perception of self and reality. (Ref. 23.4) Their reality perception is less distorted by desires, anxieties, fears, hopes, false optimism or pessimism. Even though they have this superior attribute, they maintain a special kind of humility which renders them highly teachable. During peak experience they have an even better perception of reality which, when coupled with an extraordinary creative ability, can enable them to synthesize higher-order concepts and gain insights similar to those of many philosophers, scientists and theologians. (Ref. 23.5) Their special creative abilities are universal and are applied to all aspects of their life.

They are without exception dedicated to some work, task or duty that they consider important and which brings them excitement, pleasure, and fulfillment. Their work is so pleasurable that it becomes their play and allows for a higher degree of personality integration. They work very hard, striving for perfection with much discipline, often postponing pleasure to achieve the end result. They tend to work on problems that confront society, and have a genuine desire to help the human race. They have both self-confidence and self-respect, and are more concerned with the outcome of the task that involves them rather than with the protection of their egos. Their courage or lack of fear allows them the luxury of mistakes without self-recrimination. (Ref. 23.6)

Abraham Maslow's Hierarchy of Needs



*Growth needs are all of equal importance (not hierarchical)

(Ref 23.7 - for above image)

They have a better perception of what is right and wrong based upon their own experiences. The struggle between good and bad is not a problem, and they consistently prefer to choose the better values and accomplish this with relative ease. They will resist their cultural teachings when these don't agree with their own point of view. Their values and ideals are similar to those taught by the great religions, even though they are not particularly religious. Most believe in a meaningful universe and could be considered as spiritual. Maslow stated that they accept "the transcendence of self, the fusion of the true, the good and the beautiful, contribution to others, wisdom, honesty, and naturalness, the transcendence of selfish and personal motivation, the giving up of `lower' desires in favor of `higher' ones,... the decrease of hostility, cruelty and destructiveness and the increase of friendliness, kindness, etc." (Ref. 23.8)

They feel a kinship with the whole human race and can maintain close personal friendships with others regardless of race, creed, class, education, political beliefs or nationality. They can be very tolerant of others' shortcomings, yet very intolerant of dishonesty, lying, cheating, hypocrisy and cruelty. (Ref. 23.9)

They have a set of higher needs above the basic needs of safety and security, and the physiological needs of air, water, food, shelter, sleep and sex. These "meta-needs" generally emerge after the love and esteem needs have been reasonably satisfied. (Ref. 23.10)

Their needs for freedom, love, justice and beauty were found to be universal. (Ref. 23.11) The need for truth discovery was also essential for most and was listed first above the rest, even though Maslow found growth needs to be of approximately equal importance.

Self-actualizing individuals are in a perpetual state of growth and becoming. Maslow indicated that under healthy conditions growth is rewarding and causes the healthy individual to grow more. He believed that the more one grows, the more one wants to grow. Maslow has stated that, "[T]he process of moment-to-moment growth is itself intrinsically rewarding and delightful in an absolute sense." (Ref. 23.12) Even though they have a great need for growth, they are less anxious for honors, prestige and rewards. They are more rounded, usually having an appreciation and understanding of art, music, politics and philosophy.

The self-actualizing individual, as defined by Maslow, is the product of one or more peak experiences. However, I have come to believe that there are those who are self-actualizing and have not had a P.E. A P.E. can permanently change one's life in a variety of ways, some of which have been mentioned. In addition, peak experiences produce moments of intense joy for which the individual feels so grateful that they want to do something good for the world as repayment. This actually becomes one of the very strong motivating factors which drives the self-actualizing person. A peak experience can also have beneficial therapeutic effects, with the permanent removal of neurotic symptoms. (Ref. 23.13)

The peak experience is a product of the evolution of consciousness, and is thought to occur in an increasingly larger number of individuals. It results in the transformation of certain individuals so that their perception of reality, their basic belief system, and their behavior patterns are dramatically altered. Once a critical mass of self-actualizing persons is reached, a Eupsychian-type society becomes possible.

Based upon my present understanding of reality, it seems unlikely that either humankind or any other intelligent form will ever evolve to a state where absolutely everything can be known and understood, since the universe appears to be in a constant state of flux. There are too many individual random events occurring that can only be predicted on the

basis of statistical probability. Nevertheless, if the primary premise of the Integrated Theory of Intelligence is correct, the implication is awesome.

The theory suggests that intelligence and consciousness have evolved to states of increasing complexity at a non-linear rate approximating an exponential curve, and will continue to do so as long as the universe is in a state of expansion. There is a great deal of evidence, much of which is scientifically based, to support this conclusion. This continuing evolution will occur irrespective of the process of natural selection, which will continue to act only as an editor. This in turn will result in a continuously accelerated ability to store, process and understand new information, thus allowing an increasingly more accurate understanding of universal reality. This process can be documented to a certain extent by evaluating humankind's recorded history. There can be no doubt that our present perception of reality is far better than it ever has been before, and given time will undoubtedly improve non-linearly (and probably exponentially) in the future. This also makes feasible a project such as a "Quest in Search of the Theory of Everything."

It is my belief that higher states of consciousness can result in the generation of higher-order concepts and a more nearly true perception of reality. It is also my belief that whatever counterproductive, aggressive behavior is displayed by any single individual, it is based at least in part upon decisions or choices made on the basis of imperfect knowledge and understanding of reality. Those acts which society judges as aggressive are performed by humans who are acting on this imperfect understanding. Maslow has stated, "Aggression is a reaction to the frustration of, or the inability to satisfy, basic psychological needs. It is a reaction rather than an instinct. The healthy human being who has learned to understand himself and other people will not be violent, aggressive, or destructive, although he is perfectly capable of self-defense." (Ref. 23.14)

This would therefore lead to the conclusion that those who have experienced higher states of consciousness, particularly a peak experience, will find themselves modifying their behavior to more strongly reflect a desire to do those things that will positively benefit society. A self-actualizing person has integrated goals that benefit oneself as well as the society within which one lives. As humankind continues to evolve, there will be an increasingly larger proportion of society that will be oriented in the direction of positively directed behavior, and this will benefit the individual as well as all of society. There can be no doubt that for many individuals, the greater the amount of knowledge compiled, the greater the desire to acquire more. It would also appear that the more knowledge gained, the greater one's ability to comprehend and accumulate more.

It is these combined processes of increasing intelligence, increasing consciousness and knowledge accumulation that will eventually give humankind its best hope of survival. If this were not occurring we would have no chance. Our increasing ability to destroy ourselves would eventually overcome our facility to prevent it. Hopefully the nature of humankind is continuously evolving swiftly enough to outpace our ability to self-destruct.

The best that we can do for ourselves is first to recognize our inherent intellectual and consciousness potential and then direct our collective resources to the task of enhancing both. For those who have had a true peak experience there can be no doubt that one begins attempting to live on a higher level of morality within society. One lives by a higher set of principles and ethics than ever before. One has a much greater love and respect for all of existence, and feels duty-bound to contribute more time and effort to the benefit of others. One also comes to believe that if everyone could have a peak experience, then all of society, even though still imperfect, would be dramatically transformed to a higher-level

order of existence. Selfishness and negative acts would not be eliminated, but would be drastically reduced.

As evolution of consciousness continues, it becomes increasingly more feasible to predict the eventual formation of a society which will be structured on the basis of higher-order concepts and a closer approximation of reality. Even now, if all of the self-actualizing individuals in the world worked together in tandem toward a common goal, much more could be accomplished than at present.

I am certain that in time such an organization will be formalized. It will be constructed around certain guidelines and goals, and I believe that the following items might be included.

Goals

(1) The goal of first importance might be entitled the "Quest in Search of the Theory of Everything." This would represent the beginning of the final conscious push of humankind toward our ultimate level of existence, whatever that might prove to be. By making this a most important goal, all else would fall into place. The pursuit of truth no matter what the source and cost (within reasonable limits) is an integral part of this process, and would always receive the very highest priority status. The search for truth would be perceived as the most noble of all thought processes. The better we are able to approach all truth and reality, the greater our chance of survival, individually and collectively. Maslow believed that one of the foremost tasks would be to integrate various isolated "truths into the whole truth, which should be our only loyalty." (Ref. 23.15) The emphasis placed upon this goal would help speed global understanding and unification.

(2) Establish secondary goals which by their very nature fulfill the meta-need of those individuals who feel that they want to be associated with an organization whose ethics and principles are of the highest order. One of the goals of the society would be to actively set new goals wherever a need is recognized. This is already being done within an organization called Action Linkage.

(3) The society would continuously redefine our perception of truth and reality to approximate both as closely as possible while our understanding of existence continues to evolve. This would require the very highest level of intellectual honesty and integrity and the ability to change direction as new information is acquired.

(4) This should be viewed as the most important world-wide project ever undertaken. It would be based on a principle that should ultimately result in the fastest accumulation of knowledge possible and which potentially, over a long time period, would lead to the unification of humankind. This latter goal would be rendered possible since the organization's basic premises would have no conflict with any other group.

(5) It would continually search for common ground that all societies and cultures can support as shared interests, thus resulting in more unification of thought and less division. There would be the acknowledgment of the importance of all cultures and the realization that each has had unique experiences which, when recognized, will contribute to the development and evolution of all knowledge. The effort toward a complete understanding of reality must embody principles which are applicable to all cultures without exception. The intent is to find ways in which intelligent life forms can reduce the existing conflicts that separate them, thus minimizing all adversarial relationships. We must transcend all existing philosophies and search for basic answers relative to our

purpose for existence. If there are any absolute truths, they should apply to all cultures as well as to the rest of our existence. This would provide a focus for the unification of humankind on goals which are universally applicable, thus transcending conflicting philosophies. And this in turn would help stimulate the formation and evolution of a higher social order. The free exchange of ideas between self-actualizing people of all cultures would more quickly lead to a better perception of reality.

(6) Every effort would be made to promote the highest standards of ethics and behavior achievable at each new level of development. It is anticipated that self-actualizing persons collectively would be able to maintain standards and principles of behavior at a higher level than ever before, and with less effort, because for them this is an already-natural state to which they are strongly committed.

(7) The society would continually strive to learn as much about intelligence as possible, and then use this new understanding to aid us in our ability to actively increase both our collective intelligence and consciousness. This is a key factor, the importance of which can not be overestimated. The continued growth and evolution of artificial intelligence will aid in this endeavor as an extension of natural intelligence. We must continue to learn how to learn more efficiently, and to discover new techniques for becoming more creative. This undoubtedly will utilize extensively the art of meditation. One avenue which deserves thorough exploration is the study of peak experience, since I am convinced that during this particular altered state of consciousness one has a much greater creative thought-processing ability, as well as a better comprehension and understanding of reality. It was Maslow's conclusion also that during a peak experience people have a better

perception of reality and can gain tremendous insights not otherwise obtainable. (Ref. 23.16)

(8) Attract those individuals to the organization who have the most to give and who also have the strongest desire to contribute. These highly ethical individuals have a strong meta-need to be altruistic. They would also be intelligent abstract thinkers who are capable of grasping the enormous importance of this project.

Nature of the Society

The society would be structured in such a way as to guarantee the greatest amount of success. It would be similar in nature to the Eupsychian society referred to by Maslow. He envisioned an organization of self-actualizing people capable of including all cultures. He believed that there would be a gradual, steady, nonviolent improvement in present-day society, (Ref. 23.17) with less crime, less mental illness and less need for restrictive legislation. People would be encouraged to develop their potential for love, cooperation, growth and achievement. (Ref. 23.18) This is predicated on a continual evolutionary process of intelligence and consciousness. Maslow, in referring to his Eupsychian society, once stated that it would be "the culture that would be generated by one thousand self-actualizing people on some sheltered island where they would not be interfered with...." (Ref. 23.19) He believed that third-force or humanistic psychology would play an essential role in the society. He also believed that it would actually result in a social transformation that would change the world and everything in it. (Ref. 23.20)

It would seem to me that the society should have certain characteristic features which would include the following:

(1) It would be non-political, non-religious, non-racial, and non-national. All meetings held would be open to anyone. All information within the organization would be available to anyone upon request. There would be no secrets or hidden agendas. Because of its openness it would pose no threat to any other organization or individual. None of its goals should produce any conflict with any other organization, government, religion, nation, race or culture that has the basic desire to improve humankind. One could be a good atheistic communist and another could be a good Catholic or Jewish capitalist and still share the common perspectives and goals of the society.

It is probable that most members would be spiritual by nature; however, atheists would be welcome and hopefully would feel comfortable. All beliefs would be tolerated non-judgmentally. The only membership prerequisite, which is of ultra-importance, would be that truth be actively and honestly sought above all other considerations. This includes the introspective process of self-examination. Individuals within the organization would look toward many disciplines for truth, but would necessarily rely heavily on their intuitive spiritual yearnings as well as science and philosophy. They would look for truth no matter what the source, and would attempt to integrate factual information from all disciplines and cultures in an effort to create new higher-order concepts.

(2) Self-actualizing persons from all over the world would eventually form a global network for sharing their expertise in all areas, and bring the highest level of principles and ethics into action. Many would have a genius for certain disciplines, such as physics, chemistry, law, engineering, medicine, business, public relations, politics or leadership in general. They would collectively combine the best of what the world has to offer. Membership would be open to anyone, since there would be an unlimited

number of ways to donate time, and all time donations would be entirely optional.

(3) There would be no salaried positions or financial compensation to anyone for any reason. The only personal gain that one could receive would be recognition, love and acceptance from others, as well as elevation of one's own personal self-esteem through altruistic giving of oneself to the highest of principles and goals. The only motivation for being a member would be based on the pleasure or happiness derived from actively seeking truth, and on the contributions made toward the attainment of the organization's goals. The reward would be based on the knowledge that there is no human behavior that could have higher importance than the effort contributed to the society.

Individuals who have experienced a peak experience are the ones most likely to recognize within themselves the need to explore, understand and pursue truth with the final goal of applying the information gained to the benefit of all others. As more and more individuals have peak experiences there will be a growing number who share the common perspective outlined. It has been my personal experience that the greater my perceived understanding of reality and all of existence, the happier and more secure I have become and the more I feel stimulated to learn and discover. For a self-actualizing individual the seeking of truth and its application to humankind becomes more important than any other single facet of their existence. The greater one's global understanding of truth becomes, the greater one's ability to love and respect humankind. The more accurately reality is defined, the more effective our attempts to design a better civilization, enhance communication, improve our economic structure or succeed in any other project undertaken.

(4) There would be no dues, but private donations would be accepted to help fund the purchase of any equipment needed for research or the running of the business.

(5) The society would reject war, terrorism and other acts of violence as being inconsistent and counterproductive to the achievement of its goals. Force used against any individual, group or organization would be absolutely prohibited for any reason whatsoever.

(6) It would most likely appeal to individuals who are spiritual and earnest seekers of truth. They will probably believe that science, religion and other disciplines have fallen short of providing the best approach for a way of living, even though each has unquestionably helped.

(7) Although the scientific method must be a very important ingredient in the processing of acquired information, the creation and understanding of higher-order concepts must not be restricted to any one discipline. The great powers of the intuitive unconscious mind must be utilized and maximized to the fullest extent possible.

(8) Any secondary goals can be potentially modified or added as the discovery of new truths dictate. The only goal which would remain ever-unchanged would be the primary goal, that being the "Quest In Search of the Theory of Everything."

(9) The central premise of the organization is based upon a principle which far exceeds the importance of any leader or other individual personality. The structure of the group is non-hierarchical--leadership would correlate with group goals. Participants would be drawn from all walks of life. This should be a

collective group effort made up of altruistic individuals, none of whom would ever become greater than the purpose of the organization itself.

(10) The formation of groups within the organization would be encouraged to work toward the accomplishment of whatever goal seems beneficial to those participating. Preexisting groups could become affiliated with the organization as long as they are willing to adhere to its principles.

(11) The society would be spread by attraction through the example of adhering to the highest principles, standards and ethics developed by humankind.

Benefits

The society would provide an unlimited number of benefits for humankind because of the types of people it would attract, and because of the various goals which would be accomplished. Some of the benefits might be listed as follows:

(1) It would have the potential for becoming a worldwide network, which in time could provide a strong foundation and impetus toward the achievement of world peace. There is already at least one group in existence which is similar in nature to the one being proposed, called Action Linkage.

The structure and goals of the society would keep it out of conflict with all other organizations, including those that are political, religious and philosophical. This is not to be thought of as a potential world government system, but as an organization that leaders within all governments would eventually subscribe to. Over

time an increasingly greater number of leaders in all governments would be members, or at least subscribe to the ethics and principles advocated by the organization. This would provide greater stability and unity to the world community. Governments over time would become less aggressive, more reasonable and logical in their approach to world affairs, and more peace-oriented. This would in all probability require a minimum time interval of at least several generations; however, could happen more quickly.

Every individual, group, society, religion, nation and political philosophy would benefit from its accomplishments, which would guarantee its success as a world organization. The nature, structure and goals of the society would foster trust and therefore build bridges across political, cultural and religious boundaries. Mutual trust and respect would ensure a cooperative effort.

(2) The "Quest In Search Of the Theory of Everything" could arguably be viewed as the most noble and important single concept of all time, since its pursuit could ultimately have the greatest impact upon all of existence, not the least of which could be the survival of humankind. This search would provide the stimulus for continued discovery and growth in every conceivable direction. The knowledge gained would be used well beyond the fulfillment of idle curiosity.

A further goal would be to apply our continually more accurate understanding of reality to the betterment of humankind. This is based upon the idea that the greater the amount of truth that one assimilates, the greater the potential for achieving higher states of consciousness, which in turn results in a greater ability to feel love and respect for humanity as well as all other life forms. Every question which can be formulated requires an answer, and this

therefore provides an open-ended, long-term goal and direction for humankind. This in fact would guarantee the survival of the organization without limit, because in all probability it would never outgrow the need for its work, inasmuch as our perception of reality will continue to change over time. The quest provides the ultimate road map for humankind's continued survival because it can never be outmoded.

(3) The short-term effects would be more rapid progress in all directions including the scientific, social, economic and spiritual, somewhat like the "space race" accomplished relative to the stimulation and proliferation of new high-tech industry and other scientific achievements. The long-term effect would be to provide a way to completely restructure human purpose and change the direction in which humankind is evolving to a more positive one. It would accelerate the rate of truth discovery since it would become a concerted world-wide group effort.

(4) The society would have the capacity to continually refocus itself since its secondary goals could be modified. It would be capable of adjusting itself to any type of existence required by a changing environment, whether physical, political, spiritual or other. The recognition of evolving intelligence and consciousness, along with the active pursuit of enhancement for both, will allow the organization to move ahead faster than all others in the direction of achieving its goals. Intelligence will always prevail over ignorance. Those groups or societies which are the most creative in their search for solutions to problems will be the ones most likely to remain intact. The creative process would be maximized by the operation of the organization.

(5) Once the organization became operational, its survival would be guaranteed because all of the necessary ingredients are now in existence. Its rate of growth would be a function of both need and the evolutionary rate at which self-actualizing individuals appear. The process of natural selection would ensure its survival long past that of all other organizations.

(6) The best of human behavior would be stimulated, promoting the highest possible moral and ethical standards such as would have universal application to all cultures. The organization would also provide a way for self-actualizing individuals, or any others, to fulfill any inner meta-need they might have for the giving of themselves to the most noble of causes in the service of others. To many individuals it would bring the greatest happiness and serenity, and this one fact alone would provide fuel for its continued success. The avid pursuit of truth may be one of the ingredients or prerequisites necessary for the type of peak experience that results in a new level of understanding. A peak experience in turn produces the desire to gain more knowledge and understanding of reality. This sets up a positive cycle with peak experience and new aspiration each potentiating the other.

There is a tremendous need for a Eupsychian-type society as originally envisioned by Maslow. If the world was filled with self-actualizing individuals there would be much more harmony and no war. It was Maslow's belief that the various behavioral problems that confront us, including crime, delinquency, mental illness, individual and organizational failure, are basically the result of ignorance, irresponsibility and faulty perception of reality. (Ref. 23.21) It was also Socrates' belief that a human with full knowledge would not do evil, because a fully enlightened person would recognize the damage done to self. (Ref. 23.22) Therefore, as humans become more intelligent and gain in consciousness, and thus increase their knowledge and develop a better

understanding of the consequences of their actions, their behavior should become increasingly more positive.

Maslow also concluded that man's aggressive nature is probably more cultural than instinctual. His ethnological studies determined that hostility and destructiveness among primitive cultures varied from zero percent to one hundred percent. The Blackfoot Indian tribe was found to be an extremely peaceful group with an almost complete lack of any anti-social behavior. (Ref. 23.23) He therefore concluded that pugnacious aggression can be prevented or cured. (Ref. 23.24)

In summary, I would state that through a peak experience I have come to strongly believe that humankind and other intelligent life forms are continually evolving to new levels of increasing complexity with associated higher states of consciousness. This potentially allows humankind a way to enhance its chance of survival through the gradual development of a new world order. Whether humankind has yet evolved far enough for this to be an achievable goal is a fair question; however, it is inevitable that this will eventually occur. There are enough self-actualizing people presently in existence so that an unorganized effort is already underway. There is at least one organized group (Action Linkage) already approaching the concepts presented. It is hoped that this book will act as a catalyst and help stimulate interest in this direction. I would invite anyone who sees merit in this project to join forces. I am planning to dedicate as much of my own time and resources as possible. Whatever money is generated from this book will be used to help finance any organization which subscribes to these principles.

This is the fourth edition of the Integrated Theory of Intelligence, which is to be a lifelong project with more supplementary material to follow. Whatever errors or inconsistencies are present will over time hopefully be eliminated. I invite feedback and criticism from anyone. Consideration will be given to all comments, and concepts will be

modified when appropriate. I hope that in time this will become a group effort.

Let the discussion begin!

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The author encourages questions, comments, and discussion concerning the concepts covered in this book. If you have any questions or comments regarding the "Integrated Theory of Intelligence", you may send an email to contact@supraconsciousnessnetwork.org.

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About the Author

Licensed to practice medicine in Utah and California, Dr. Roger D. Blomquist currently works as the Head of Radiology and Nuclear Medicine at the Sevier Valley Hospital in Richfield, Utah.

He Graduated from The University of Utah Medical School in 1963, serving his internship and residency in an affiliated program with the University of Utah in Salt Lake City. He is certified by both The American Board of Radiology, and The American Board of Nuclear Medicine.

He is a member of The American College of Radiology, The California Medical Association, The Society of Nuclear Medicine, The Utah State Medical Association, and The Central Utah Medical Society.

He has served as a member of The Board of Directors of the Palm Springs Medical Center; President of the Board of Directors of the Palm Springs Medical Center; Secretary of the Central Utah Medical Society; President of the Medical Staff of The Sevier Valley Hospital; is currently a member of The Board of Directors of The New Horizons Crisis Center; and is currently the President of the Board of Directors of The New Horizons Crisis Center (women's shelter for victims of domestic violence serving the Six-County area of South Central Utah).

A veteran of the United States Air Force, he served as an officer with the rank of Captain from 1967 to 1969.

The author of "Integrated Theory of Intelligence", published in 1991, Dr. Blomquist is currently working on a follow-up publication entitled "Quest in Search of Ultimate Theory of Everything". Click on http://www.supraconsciousnessnetwork.org/AboutUTE.htm to read about this new book.

Some more information about Dr. Blomquist, including a couple of photos, is found on the "About the Author" page on our web site. Just follow the link named "some interesting info" at the very bottom of the page to be taken to this page authored by his son Craig Blomquist.

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