

Chapter XVIII

The Information Architecture of the Universe

INTRODUCTION

For years, the construction of the universe has occupied the best minds of theologians and scientists. The first modern breakthrough was made by Copernicus about 500 years ago. Later, in the 20th century, contributions were made with the bold theories developed by Albert Einstein, Edwin Hubble, Roger Penrose, Stephen Hawking, and others. Science continues to discover the great mystery of the universe and life. But the more we know about this subject, the worse our outlook may be on the fate of humankind. The magnitude of the universe and our own smallness are in such contrast that it seems we are in a hopeless situation, even if you take into account only life's perspective on the earth. However, the study of the universe may bring some unexpected surprises and humankind may after all have a future, particularly if we decipher the mystery by whom and how the universe was developed.

This study has assumed the position of considering intelligent design in the origin of the universe, but with the addition of proposing that any existence of intelligent design would suggest corollary problems that must be scientifically testable.

INFORMATION CONTROL IN LIFE ORIGIN

Since the late 1950s, advances in molecular biology and biochemistry have radically improved our understanding of the mechanisms of the biological cell. The cell, the basic building block of life, possesses the ability to store, process, and transmit information. Furthermore, it can use information to steer the most fundamental metabolic processes. Cells are in fact complex information processing systems that support activities.

Information (on what and how to produce proteins) transfer within a cell takes place from DNA (deoxyribonucleic acid) to a set of 20 different kinds of amino acid molecules to assemble into each given type of protein. Protein molecules may be thought of as the workhorses of life. Some proteins act as *enzymes* with such jobs as catalyzing digestion of the proteins we eat. Other proteins, such as *hemoglobin* in blood, help carry *oxygen* from the lungs to the rest of the body. Still, others form connective and supportive tissue. Proteins constitute a large portion of the mass of every life form and are necessary in the diets of all animals. DNA is the chemical substance found in all living organisms which

directs the production of proteins. DNA contains genetic information passed on to new cells and new organisms. DNA stores millions of specifically arranged chemicals called *nucleotides* or bases within the DNA's structure. The sequence of nucleotides (represented by A - Adenine, C - Cytosine, G - Guanine, and T - Thymine, horizontally linked by hydrogen bonds) in the DNA molecule convey (through the sugar-phosphate backbone) precise biochemical information that direct protein synthesis within the cell¹.

The chief function of all living cells is assembling protein molecules according to instructions (information) coded in DNA molecules. DNA is like the "operating system" of a cell, which contains coded (in different configurations of A, C, G, T) instructions of how to handle proteins. Different segments of DNA create (according to these coded instructions) *genes* that are organized in *chromosomes*, each of which has a specific function. (There are also *epigenetics*, individual genes, which can be turned on or off). All these components of a cell are information-driven. The nucleus of a cell, containing the chromosomes, is a "library" containing life's instructions. The chromosomes would be the "bookshelves" inside the library; the DNA would be "individual books" on each shelf; genes would be the "chapters" in each book; and the nucleotide bases making the strands of DNA would be the "words" (A, C, G, T) on the pages of the individual books. The information-communication messenger of DNA is RNA, which transfers "DNA-heredity patterns" between a cell's components (mostly proteins) in order to facilitate their replication and to maintain the organism.

The coded sequence of bases contains a unique pattern setting forth the chemical specifications for a living creature. These sequences of DNA pairs are, by definition, genes (special messages), which govern the chemistry of life and determine all inborn characteristics, from blood type to eye color. A human has 100,000 genes packed into 23 pairs of chromosomes (Brennan, 1992).

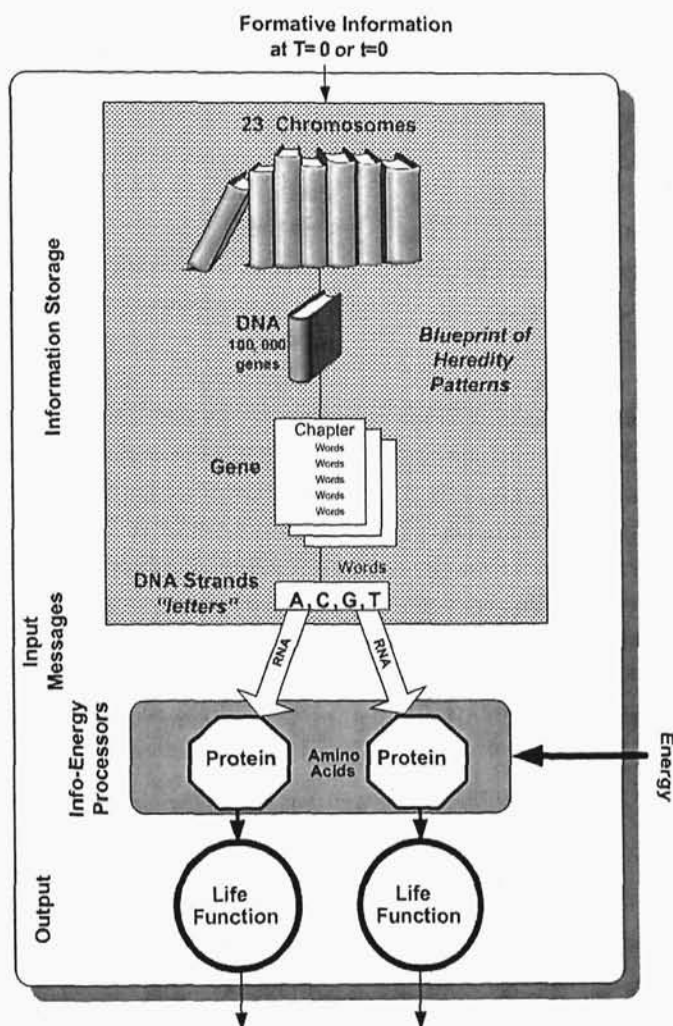
Writing down the DNA sequence of one human genome demands approximately 3,000 volumes of data each the size of the Bible (containing 1 million letters, punctuation marks, and spaces as estimated by Ayala [1992]).

Rupert Sheldrake (Briggs & Peat, 1984) reasoned that since every cell in an organism has exactly the same DNA code, it is difficult to see how this identical DNA configuration of each cell could be distinguished from one cell in the brain tissue and another cell in the muscle tissue. Sheldrake developed a hypothesis that there exists a state in which DNA and the forming processes of an organism are mediated. This mediator is a complex set of *hidden fields* that direct all stages of morphogenesis and acts to establish the final form that things take, including behavior. He calls this the "hypothesis of formative causation."

Yale biologist Harold Saxton Burr (1982) discovered *L-fields*, which are results of different patterns of electricity for different types of organisms—trees, slime molds, human beings—and found that each type of organism has a similar pattern. Changes in the L-field reflect a change in one's mood or a stage of an illness or his/her movements in the environment. Burr speculated that the L-fields are not a cause of evolutionary changes but that they direct the changes².

Figure 18-1 illustrates the information-communication model of a living cell. The information at $T=0$ and $t=0$ reflect the hidden fields of regulating formation of an underlying cell, where $T=0$ is the first time of the universe and $t=0$ is the first time of a given cell. Other components of a cell, such as DNA-ases, reverse transcriptases, and non-peptide cellular components (*steroids, flavins, GTP, GDP, ATP, lipids, sphingolipids, cholesterol, inositols*, etc.), are not shown in the model. The proteins exposed in the model reflect the aggregated concept of all kinds of proteins encoded by DNA (*peptides, hormones, enzymes, cytokines, chemokines, skeletal proteins, accessory proteins, receptors, allosteric modulators*, etc.).

Figure 18-1. Info-communication model of a living cell where $T = 0$ is the first time of the universe and 0 is the first time of a given cell



The informational properties of living systems suggest that "no materialism" can suffice to explain the degree of complexity of origin of life. The progress made in molecular biology and the information sciences have revolutionized our understanding of the complexity of life, they have also made it progressively more difficult to conceive how life might have arisen by purely mechanistic means (Meyer, 2007).

The discovery of the role of information in life's processes took place in the second part of

the 20th century and is in strong contradiction with the 19th-century theories of life, which stated that life was built of cells which were in themselves no more complex than a blob of gelatin. The more we know about life's microstructures, the more the role of information in life's functioning is emphasized. Could the same be said about the role of information in the processes of matter?

HYPOTHESIS OF THE INFORMED UNIVERSE

This study is conducted from the point of view that humankind has a chance in the universe. As a result of this, we assume the following:

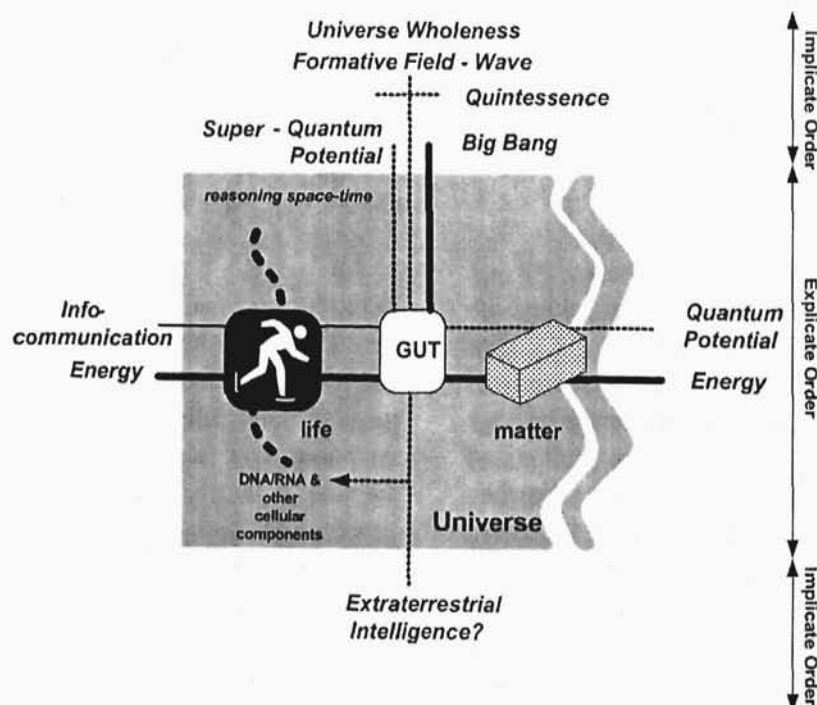
Hypothesis 1: Our local life system is a hierarchical info-energy system, in which the first steering information came from either outside of the Milky Way Galaxy or outside of our universe.

If this hypothesis is true, then the physicists' effort in defining the grand unified theories (GUT)³ cannot be successful if it does not include the integrating role of information-communication processes in the universe. This role is suggested in Figure 18-2, in which life and matter are presented as one info-energy process. A link between DNA and the rest of the universe is maintained by

the human information-communication process. This is a digital process now being continually enhanced which converts internal, analog DNA/RNA processes. (DNA seems to consist of a long series of on-off switches, if it is a digital chain of reactions.) This conversion reflects a flow of analog information from/to a brain and to/from digital information in a mind and the role of hidden fields⁴.

A key to solving the mechanism of information-communication synchronization of life and matter in the universe is the ability to define the nature and relationships of super-quantum potential with the processes of eventual intelligent design and their relationships with the remaining info-energy systems. At this time, our knowledge does not yet have the right tools to investigate and define this mechanism. At the moment this mechanism may seem to us as of a supernatural character.

Figure 18-2. Grand unified theories (GUT) of information and energy interactions



The impossibility⁵ of defining the GUT by the physicists results from the fact that they do not include the information, “intelligent design,” ET, quantum potential and quintessence force factors in their assumptions and calculations. The present level of our knowledge cannot define that type of information empirically. However, we should be aware that this information may come from beyond our physical reality and that this may be the key to solving the logic of the universe.

The survival of human civilization in space-time may be better understood if we first investigate the influence of intelligent or other eventual design on the expansion or contraction of the universe. This task can be associated with the issue: what is the universe?

Albert Einstein approached this task from the gravity point of view and he elaborated on the gravity equation⁶ (also calling it God’s equation), in which the shape of the universe depends upon its mass and the cosmological constant λ . According to this equation, the larger the mass of the universe within a given confined space, the

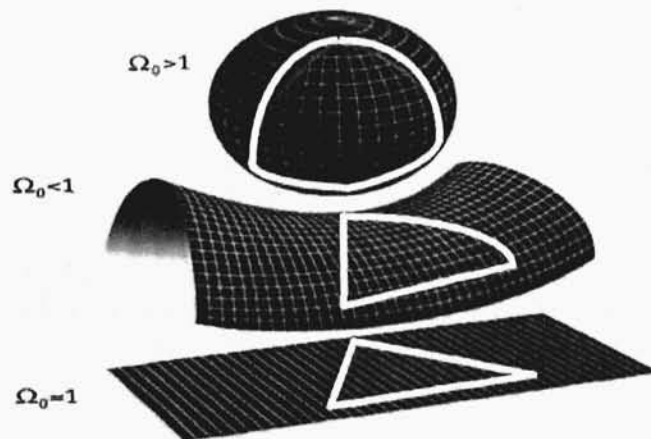
more curved is its space, since greater gravity strongly curves space around its mass. The latest research of the universe’s shape confirms that it is expanding while remaining flat within our limits of measurement.

Physicists and astronomers are fascinated by the task of defining the universe’s geometry. The geometry of the universe is determined by cosmology, which attempts to define how the three-dimensional universe evolved through time:

- A spherically-shaped universe starts to expand (at an increasing rate) and then starts to collapse back on itself ($\Omega < 1$)
- A cycloidally-shaped universe ($\Omega > 1$)
- A flat universe ($\Omega = 1$) will expand at a decreasing rate

Here Ω (omega) denotes the cosmological ratio of the actual density of the universe to its critical density in the Einstein gravity equation. Figure 18-3 illustrates the universe’s shape defined by the cosmological constant.

Figure 18-3. The universe’s shape defined by the cosmological constant Ω (M. Kermanshani-<http://www.toevault.com/articles/20/1/Shape-of-Universe/Page1.html> Retrieved November 26, 2007)



But what happens if the intelligent or other design of the universe takes place from within the same universe, which then might affect its own expansion, geometry, and destiny? If there is some “funny energy” out in space, something that we cannot see, feel, or detect but which acts on the very fabric of space-time, making it expand faster than it would otherwise, then matter and the gravitational force it produces would not be alone (Aczel, 1999). Both dark matter and dark energy are very recent hypotheses, not even thought of until a few years ago, and now they are thought to comprise 94%-96% of the effective mass of the universe.

Having in mind something unexpected, cosmologists decided to allow a portion of the total Ω to reflect the part due to matter (Ω_M), and a remaining part to identify the “unexpected energy” (Ω_Δ) (something which resembles Einstein’s old cosmological constant λ). A new parameter determining the geometry of the universe is:

$$\Omega = \Omega_M + \Omega_\Delta$$

This equation means that regardless of the Ω_M , the Ω_Δ can be enough by itself to push the universe in the expansion mode forever.

In 1988, Saul Perlmutter from Lawrence Berkeley National Laboratory and his colleagues began the Supernova Cosmology Project to estimate the values of the omega parameters by studying the light curves of type I_a supernovae. They did find that the value of Ω_M was smaller than anybody had expected. The exploding stars halfway across the cosmos were pushed by an unseen force and the co-efficient Ω_Δ and Einstein’s cosmological constant λ were significant (Aczel, 1999).

This research conducted by Saul Perlmutter confirmed the role of an intelligent or other design in the universe. Paul Steinhard calls this invisible force *quintessence*, after Aristotle’s fifth element of nature to designate a presently unknown fifth physical force. Steinhard insists that Ω_M is less than 1 (the universe continues to expand) and that

Ω_Δ has some fundamental meaning for physics (Aczel, 1999).

To understand the mechanisms of intelligent or other design, super-quantum potential and *quintessence*, it is necessary to define the architecture of the universe, which so far has been investigated mostly by physicists as “civil engineers of the universe.” The architecture of the universe is shown in Figure 18-4. Its main hypotheses are:

Hypothesis 2: Among more than billions of solar-like systems in the universe, some should have the right conditions for the existence of life, because in such an enormous set of planets, statistically the Earth should not be the only life-friendly environment.

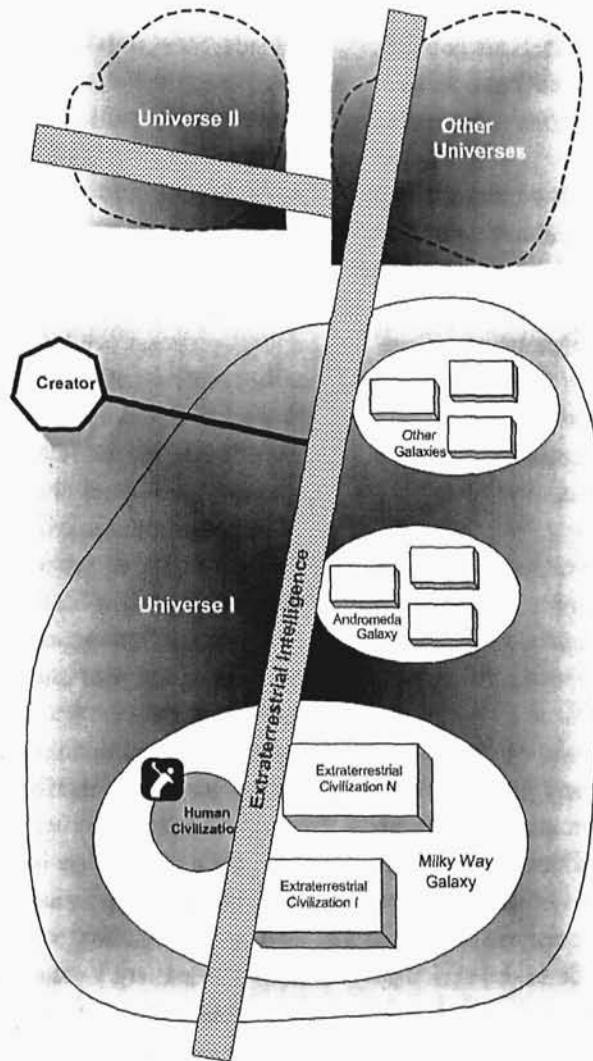
This hypothesis can be shown highly probable with statistics, although it cannot be proved empirically by science at this time. (Each statement in this case is just an educated guess.) Polish astronomer Aleksander Wolszczan discovered the first planet outside of our solar system at the end of the 20th century, which indicated that the universe may have conditions able to support life outside of our own planet (Eduscript, 2007).

Hypothesis 3: Life in the universe may have been present long before it existed on the Earth (at most 9.4 B years after the Big Bang) and therefore could have developed its own more advanced scientific-technical knowledge and civilization wisdom.

Wise humans have inhabited earth for more than 200,000 years, but we have applied scientific-technical knowledge over just the last 500 years or so. If Hypothesis 3 holds true, living creatures from other planets could have developed knowledge far beyond ours.

Hypothesis 4: Extraterrestrial intelligence?, super-quantum potential and the quintessence

Figure 18-4. The universe architecture



forces reach other solar systems (including the Earth's) from other civilizations or from other universes which are at a much higher developmental level than that of our own.

Carl Sagan (2000), one of the most prominent American astronomers, stated that there are many manifestations of extraterrestrial intelligence, which contemporary astronomy does not understand, for example, quasars' natural or

very high- intensity gravitational waves that are coming from the center of our galaxy remain a puzzle. He estimated that there are at least a million other stars and planets on which today there are advanced civilizations. Also, there is at least a fair probability that there are many civilizations beaming signals our way. However, because of the vast distances between stars, there will be no cosmic dialogues by radio transmission. (One conversation in a round-trip communication

may take 600 of our years). Our civilization does not have enough time and money for such communications. Perhaps communications between two very advanced civilizations will take the form of a science and technology that is inaccessible to us now.

So far, we have found nothing certain about extraterrestrial (ET) communications. Some tantalizing "events" have occurred, such as signals that have been recorded which satisfy all the criteria for ET intelligence except one: the signal never repeats. We have only just begun the search for ET intelligence. If it is confirmed, then our view of the universe's mechanisms and ourselves will be forever changed (Sagan, 1997).

Hypothesis 5: The sequential rise of a civilization requires intelligent design and a quintessence force, coming from a civilization at a higher developmental level than our own or from a creator.

This hypothesis is the generalization of Hypothesis 4, which was applied to our solar system only. However, there are convincing arguments that the human civilization is not unique in the universe⁸. According to the Copernican principle, no cosmological theory can be taken seriously that puts our own galaxy at any privileged place in the universe. Which means that a civilization cannot be created by itself; it requires "bylaws" from outside.

Hypothesis 6: The triggering of the Big Bang requires the existence of the primeval atom or info-energy process (first signals) that must have come from a higher civilization. However, at the moment of the appearance of the first universe, this signal could only have come from its "creator," which can be god or nature.

This hypothesis is the generalization of Hypothesis 5, except that it applies to more than just our universe, whose Big Bang signals we can

register. It also confirms that any universe cannot rise from within. It also requires "bylaws" from outside. Steven Hawking assumes that before the Big Bang ($T=0$) there had to be a primeval atom⁹ that triggered the explosion.

Both Hypotheses 5 and 6 accept the laws of mass preservation and information preservation. This implies that the consecutive formation of an info-energy system is only a transformation from a previous state. However, information as an info-energy process does not rise from "nothing;" it has to be triggered by something or somebody. (The biologists however may question this statement, since "emergent properties", whereby systems can generate additional characteristics as a product of increasing complexity, even when there was no sign of those properties at lower orders of complexity. It is a biological process, involving capacities in advanced animals that have no precedents in lower ones.)

The present level of our knowledge renders us helpless in understanding the universe's size. This is a result of the following:

1. Our knowledge is not complete nor even close to the saturation point, and perhaps never will be¹⁰
2. Heisenberg's uncertainty principle implies that in the sub-atomic world there are certain kinds of information that cannot be learned in specific detail, because the act of measuring changes what we are trying to measure
3. Perhaps a "creator" does not want us to know his/her system of ruling the universe¹¹

On the other hand, whether the universe is stable or unstable, open or closed, contracting or expanding, flat or spiral, has no practical meaning for humans, because these processes take place in very long periods, measured in millions and billions of years. Whether or not the universe will last 50-60 billion years does not have practical meaning for humans. But this does not mean

that it is not necessary to conduct research on the universe, because some solutions may have an influence upon our short lives.

Recent observations by the Hubble Space Telescope and the Wilkinson Microwave Anisotropy Probe (WMAP) have found that the bulk of the universe is made of dark energy, which acts through dark force (the author's assumption). Current estimates of the mass/energy budget place dark energy (dark force) at roughly 70% of the universe, while visible matter and dark matter make up less than 30%. Most of the universe is made of something we know nothing about (Wilson, 2007). This observation allows for the following hypothesis:

Hypothesis 7: At the moment of the Big Bang, dark energy interacted with the united four normal forces, composed of the strong force (binding atomic nuclei), electromagnetic force (holding atoms together), weak force (controlling radioactive decay), and gravity. This interaction perhaps was triggered by the external force, coming from some external environment (universe).

As of the moment the physicists think that the four basic forces were originally united by the density and temperature of the original blob. Gravity separated out first, then the strong force, leaving the “electroweak” force which split only sometime later. (One can occasionally wonder if there is another split sometime in our future.) If there were initially only two forces (united and dark) active during the Big Bang (and up until a certain span of time over which the united force separated into the four normal forces), this idea may lead to the assumption that in fact the united force and dark force are also coming from a common force, which was perhaps the external force, coming from—T (?). If this is true, the source of the external force could be the external universe. The proposed role of the external force in this process of forming and operating our (internal) universe is illustrated in Figure 18-5.

The “controlling” function of the external force, if it does exist, should be involved in all cross-roads of the seven basic forces which rule the universes, as illustrated in Figure 18-6. This controlling function is perhaps based on a kind of quantum-potential signal and other ones, which we do not know at this moment and which are the subject of searches by several centers, including the SETI.

This study suggests that further research on the universe should include the role of information-communication processes, ET intelligence, and supernatural processes (intelligent design). Space research brings solutions in technology and medicine that can be applied in our civilization.

Up till now physicists, astronomers, and cosmologists have made good progress in deciphering the universe's construction and its development, but mostly at the level of matter and even self-contained matter. Taking into account the role of humans and the amount of external steering necessary, we need to take a look at the universe as a system (U_s), which can be defined by the following equations:

The Contents Equation of the Universe System¹²:

$$U_s = I_d \cup I_e \cup Q_{sqp} \cup Q_{ss} \cup [(H, R_h), (L, R_l), (M, V_e, R_m, R_{qp}, R_{ot})]$$

where:

I_d – Intelligent design information

I_e – Extraterrestrial information

Q_{sqp} – Super-quantum potential

Q_{ss} – Quintessence (external) force

H – set of humans

R_h – set of structure-forming relationships among humans and their environment, including information-communication processes, DNA, cyberspace processes

L – set of living organisms of lower order than humans



Figure 18-5. External force as the source of other forces

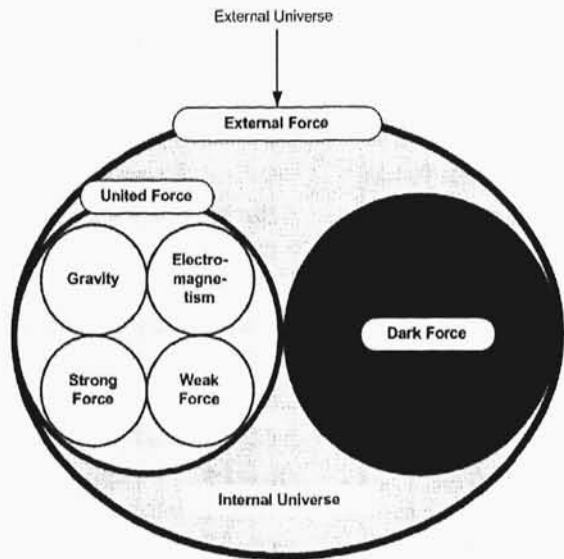
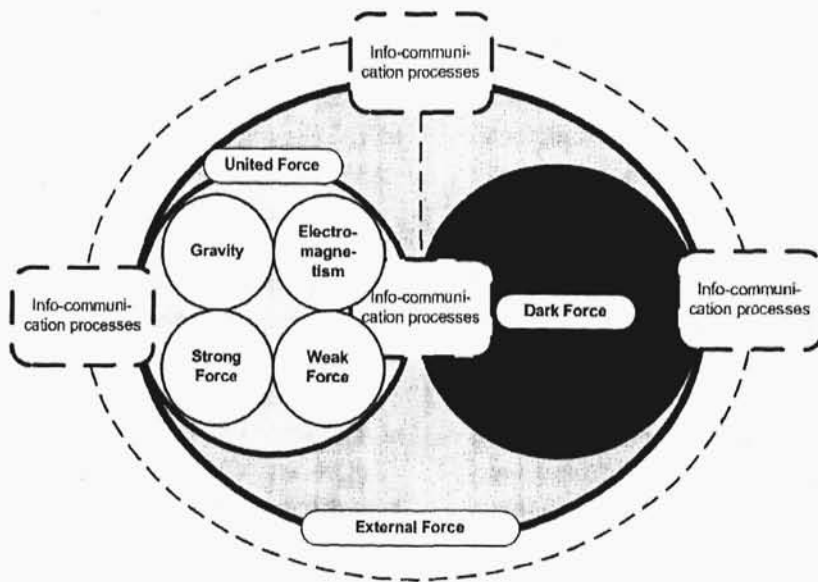


Figure 18-6. Steering role of info-communication processes in the dynamics of the seven grand forces of the universe



R_l – set of structure-forming relationships among living organisms

M – set of energy-matter

V_e – Vacuum energy (energy for the oscillating creation- destruction of virtual particles)

R_m – set of structure-forming forces

R_{qp} – set of structure-forming quantum potential

R_{ot} – set of other structures

To define such a dynamic character as the universe, one must escape Einstein's 4-dimensional space-time continuum (4-D). By including the role of information-communication processes and other forces, we will deal with a 10-dimensional (10-D) space-time of the universe (at least in this study, though it may not be necessary otherwise, reality can be even more complex). The new 6 dimensions are: information-communication human processes, their cyberspace, ET (extraterrestrial intelligence), eventual intelligent design (supernatural information), quantum potential, and super-quantum potential.

The task of defining the final theory of everything is unfeasible at our present level of knowledge¹³. The range of difficulties was exemplified by a mathematician from Oxford, H. Aldersley-Williams (1996), who analyzed a topology of 4-D space-time and apparently discovered a strange relationship between 4-D space-time surfaces and "exotic" physical phenomena, unique for 4-D space-time. Four-dimensional geometry is pathologically "badly behaved." One of the best specialists in 4-D space-time was the Russian mathematician Lew Pontriagin (1908-1988), who may have been able to understand that space because he was blind; his mind was not confined to the normal arrangement. One can imagine how complex 10-D space-time is, particularly if in the synthesis of the mechanism of the 10-D universe one must go beyond the quantum theory, the string theory and include the theories of entropy, fuzzy sets, imaginary numbers and perhaps others, as for example, the currently popular cutting-edge

theory, which is called "brane theory," shortened from "membrane theory," which suggests that the determining factors of the universe are a collection of approaching-but-not-intersecting planes of peculiar geometry. Gravity, for example, is so weak because it leaks between branes.

CONCLUSION

Steven Weinberg (1993), who, with collaborators, defined a part of the GUT, is optimistic and states that this task reminds him of geographical discoveries in the 19th century, when pioneers were moving towards the North Pole and gradually were discovering new territories, mountains, rivers and so forth, until there was nothing left to discover¹⁴.

Perhaps during this century and millennium we will discover more and pursue this task of defining the final theory, or perhaps it is too soon and we will need another, let us say 10 million years, to do it. Maybe there is no such theory. Or perhaps there is a "creator" that does not want us to know it?

A. Further Research Directions

- Investigate how information-communication processes and systems impact the physical processes and systems of the Earth, and what is the impact of this interdependence on civilization.
- Investigate the grand unified theory in a more complex framework than the physicists do, in order to find interdependence between living organisms and "dead" matter, which can lead to better understanding how humans can survive in a very competitive nature.
- Investigate the possibility of life on other planets and how it can benefit humans, even in a long-term horizon.
- Investigate what kinds of technologies must be developed in order to use other planets by humans.

B. Research Opportunities

- The research opportunity is in analyzing the nature of the Earth and universe in the information-communication—"dead" matter framework. So far, physicists analyze the universe in terms of four forces, which do not take into account a dynamic force such as information-communication.

C. Additional Ideas

- If the Earth and universe are products of randomness, what is the chance that humans could have appeared? What kinds of strategies should humans develop and apply in order to be knowledgeably aware of their chances? Do we have a long-term future? If not, what should be our short-term strategy? If there is hope, what should be our long-term strategy?

D. Rationale

- The key to the answer how to act in order to be successful in the long term, that is, not go extinct, is a research strategy which can only come from further and more profound research on the universe's dynamics. Nowadays, the 21st century is adding information-communication issues to 20th-century physics, which up till now have been only matter-oriented. Perhaps in the coming centuries, science may add to our knowledge other universe-oriented processes which are black boxes at this time. To open this kind of a black box of universe, one must understand how its complexity is a product of confrontation between order and chaos. We want to know what kind of information-communication impulses turned a primordial soup of simple molecules into the first living cell—and what the origin of life some four billion years ago can tell us

about technological innovation today. Are they a product of randomness or a distance control? Particularly very interesting is how the random process of Darwinian natural selection managed to produce such complex system as humans? Is there a sort of information-communication spark involvement? Certainly, it is a dynamic process and cannot be driven by "dead" matter's transformations only. What controls that transformation? If we apply a term "control" it implies "signal" flow and so also, information-communication dynamics. Needless to say, that kind of process will lead to a new paradigm of the universe's architecture in the coming centuries.

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ENDNOTES

- ¹ The amount of DNA in a cell varies roughly with the complexity of the organism. Bacteria have several million nucleotides of DNA, fungi have several tens of millions, flowering plants may have several hundred billion and humans come in at around three billion nucleotides.
- ² Despite Burr's rigorous adherence to acceptable scientific methods, his hypothesis did not receive much attention.
- ³ Sometimes this is also called TOE—theory of everything.
- ⁴ Hidden fields mentioned by Rupert Sheldrake.
- ⁵ Theoretical physicists continue to search for a "theory of everything" (TOE). The most promising candidates are "string theories," which propose that sub-atomic particles are point-like but are strings so tiny that they appear to us as points. It is thought that these strings vibrate at different frequencies, like

a violin string playing different notes, and each different vibration is seen in our world as a different particle. Some theories predict the existence of new particles, which have not yet been detected. They should be associated with information-communication processes and super-quantum potential and quintessence force. A mysterious 'fifth element'—in addition to air, earth, fire and water—which held the moon and stars in place. Quintessence, some cosmologists say, is an exotic kind of energy field that pushes particles away from each other, overpowering gravity and the other fundamental forces.

⁶ $R_{\mu\nu} - 1/2 g_{\mu\nu} R - \lambda g_{\mu\nu} = -8\pi G T_{\mu\nu}$ where $R_{\mu\nu}$ is the Ricci tensor, R is its trace, λ is the cosmological constant, $g_{\mu\nu}$ is the measure of distance—the metric tensor of the geometry of space, G is Newton's gravitational constant, $T_{\mu\nu}$ is the tensor capturing the properties of energy, momentum and matter.

⁷ The search for other beings in the universe has been a common theme for the last two centuries. Science fiction writers, including Jules Verne, Ray Bradbury, Arthur Clarke, Isaac Asimov and Stanislaw Lem, as well as such popular entertainment as *Star Trek*, have been fascinated by the possible existence of extraterrestrials. In 1960, Frank Drake sent signals to Epsilon Eridani and Tau Ceti from Green Bank Radio Astronomy Observatory, in Project Ozma. This was the first real attempt to contact extraterrestrial species. A search for extraterrestrial intelligence (SETI) program was initiated by NASA in 1992 and canceled in 1993. Since then, the SETI Institute in Mountain View California has initiated a privately-founded project in Phoenix. Another SETI program is privately funded—Megachannel Extraterrestrial Assay (META), sponsored by the

Planetary Society. The major problem with SETI is the distances involved to receive a signal and figuring out what language to use. What are the chances of hearing from another intelligence? No one really knows. We may be receiving signals from other beings right now, but are not yet able to interpret their way of communication. It is interesting to note that we have not had any contact that we know of with other civilizations, either because they have disappeared or they contacted us in systems that we do not know. Perhaps we may still receive such contacts or perhaps there are no such civilizations. Another hypothesis, well known among sci-fi buffs, argues that earth is a "nature preserve," deliberately left alone until we meet some qualifying status.

⁸ There is an opinion that it was a fireball at a diameter of 100,000,000 miles and temperature 10^{10} °K (Iberall, 1972).

⁹ "When the number of factors coming into play in a phenomenological complex is too large, scientific method in most cases fails us" (Albert Einstein).

¹⁰ This idea was developed in genesis, with the tree of the fruit of knowledge.

¹¹ One can define the universe system as a hierarchical one.

¹² The string theory at least combines quantum mechanics and gravity in a way that explains how the gravitational force is carried, but if a string represents a gravity quantum, it can be treated also as an information-communication quantum (similarly to a guitar string under tension, which generates different musical notes).

¹³ The task of defining the final theory is according to Karl Popper not possible, because "every explanation may be further explained by a theory or conjecture of a higher degree of universality."