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# Cosmology

Philosophy and Physics

Think Lab

The essays on this book are the notes from the e – learning courses that were given by the thinker Alexis Karpouzou during the winter of 2014. Students studying in London, Amsterdam, Berlin and Paris took part in the courses, which were held by the educational and cultural center “Think Lab”, located in Athens.

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## The Adventure Of Modern Physics

The indeterminacy of the quantum universe constituted a radical transformation of the thought about the natural world. Before the formulation of the quantum theory, the physicists believed in a universe that worked with the principle of causality. Laplace, at the “Philosophical Essay on Probabilities” summed up his thesis: “we owe to consider the present situation of the universe as the result of its former situation and as a cause of the one which will follow. If only could we imagine a genius that would understand all the forces of nature and the relative state of affairs that constitute it, then for that genius nothing would be uncertain. The future, as well as the past, would be present in our eyes.”

However, the particles of quanta present the principle of complementarity, since they present the properties of a particle and of a wave at the same time. The physicist Erwin Schrodinger developed a mathematical equation that describes the dual behavior of particles. Yet a reason to justify the behavior of the particle can be found neither in the formulas nor by observation. The consequences of the indeterminacy are better depicted at the thought experiment designed by the physicist Erwin Schrodinger, which was known by the name Schrodinger’s cat. At the famous Schrodinger’s thought experiment we cannot determine with certainty whether the cat inside the box is dead or alive before the observation. Before the observation the cat is dead and alive in equal proportions (50% - 50%), as is a particle that performs an infinite number of possible behaviors at the same time.

Which is, however, the point of Schrodinger’s wave function  $\psi$ ? The conventional interpretation that is accepted by most quantum physicists about the thought paradox of Schrodinger’s cat is known as the “Copenhagen Interpretation”. M. Born supported that the square of the wave function  $\psi^2$  gives the probability that the electron is found in a particular position. This interpretation that relates the wave to the material substance of a wave particle introduced a probabilistic state, displacing the classical causality. According to the above, when the equation is divided into two, then one of its representatives at the schematic area, just collapses. Instead of the equation leading to a plethora of results, it is reduced to a single result. A schematic

space is a pictorial diagram in which an object is illustrated in the three dimensions of space depending on the time.

At the “Copenhagen Interpretation” the equation does not depict reality; the equation is simply an algorithm, a mathematical method for creating statistical forecasts. For example, the result of the experiment with the cat will be a dead cat or a living cat. John Wheeler, a physicist from Princeton University considered that the term “observer” should be replaced by the term “participant”. A participant is someone who does not only observe one event, but he transforms it by the simple act of his observation. “Maybe the universe comes to a state of existence, in a weird manner, by the participation of those who participate. The vital act is that of the participation.” For Wheeler “subject” and “object” create one another. Sir James Jeans supported that the creator of the matter is, probably, the mind. Jack Sarfatti expressed the hypothesis that the “structure of matter, may not be independent of the consciousness”. For Eugene Wigner, the paradox of Schrodinger’s cat takes place the very moment of the experiment when the human observation intervenes. He supported that the consciousness is the hidden variable that decides on the outcome of any event.

During the 1950s, Hugh Everett expressed the theory of multiple universes. His interpretation supports that the universe is continuously divided into a surprising number of parallel realities. In such a universe, not only do we exist in an undetermined number of worlds, but also at the same universe all the possible outcomes of any incident are inherent. According to the theory of multiple universes, the universe is divided into an infinite number of universes, which come from the interactions of the thousands of its components. In that universe every quantum transformation that takes place in whichever star, of whichever galaxy or at whichever position at the universe, divides our earthy world into a myriad of imperfect copies of itself, which, however, ignore one another. In Schrodinger’s experiment, the moment of the selection, when the observer opens the box, the universe is divided into two identical copies, identical in all details, apart from the fact that at the one the cat is dead and at the other it is alive. Both probabilities (cat dead and cat alive) are equally real but exist in different universes. Every cat that survives in our universe dies in another universe or vice versa. Everett’s interpretation about

a cat that is simultaneously dead and alive, in equal proportions, proves and disproves itself at the same time. This way, the solution to the dilemma of the indeterminacy is possibly at a universe in which all the probable results of the experiment coexist. The theory of multiple universes supports that every time we decide between two alternative solutions, the act of observing cuts the thread connecting the two alternate realities and in that way, it leaves each one to follow its own path through space and time. In other words, in space - time landscape all events coexist. Our choices are those who define which events will become “real” for us and which we are never going to learn about. The physicist John Gribin mentions: “Everything is possible and we in our actions choose our paths through the worlds of quantum”. In the language of the theory of multiple universes, the choices created by ego, separate the quantum worlds, which increasingly go away. On the contrary, the choices that restrict the ego, act as attractors that connect separate universes, communicate with nodes, which get information from multiple sources simultaneously. The emergence of the universal consciousness is the deep knowledge that develops when the Ego of the consciousness collapses.

## **The United and Timeless Universe**

The Ego of consciousness makes an incision at the architecture of the four dimensional space – time universe and distinguishes the man from the world and the beings. In that way, the conscious subject is created on one side, and the object is created on the other one. According to the cosmologist Lide, the Universe and all the physical laws appear as a quantum fluctuation and are represented by a wave function which does not depend on time. The observers have a feeling that the cosmic events evolve as a function of time. This happens due to the fact that the consciousness of Ego separates the united universal world into two beings, the “observer” and the “Universe”, the “Ego” and the “Nature”. The wave functions of the two separate beings depend on time. If, however, these two entities are amalgamated, time stops affecting their mutual function, and as a result their being. In that sense the United Universe is Timeless.

The fact that the ego of the consciousness makes an incision at the united universal world and separates the world into “ego” and “nature”, and introduces in that way the “Arrow of time” (Arthur Eddington), namely, it produces entropy, does not mean that the human is no more a being of the universal and timeless world. It is the ego of the consciousness, according to the special theory of relativity, that always realizes the time and the world compared to its reference frame. This way, the ego separates itself from the other egos – selves, namely, it separates the time into past, present and future. This, however, is a mythological construction of the world, an illusion. The quantum space – time universe is united and timeless and its beings are four dimensional and have got quantum properties, namely they are carriers of the holistic information of the universe. The whole universal information that existed in the past, exists in the present and will exist in the future, is in the man. Every being of the four dimensional space – time is not simply a part of the universe, it is the universe itself! The fact that the humans believe that they think individually constitutes a self - illusion and leads humanity to suffering and disasters. The thought is a process of the united and four dimensional universe. Its expression, however, depends on the level of the cognitive and consciousness development of every human being.

## **The Nature of Light, Uncertainty and Teleportation**

In order to comprehend the science of teleportation, we have to study the nature of light. Quantum physics opened new horizons in human perception and created a series of new principles that assist the knowledge of the universe. In 1900, Max Planck, in his attempt to explain the black body radiation based on the laws of thermodynamics, was obliged to separate energy into tiny parts, the quanta, by introducing a new principle,  $h=6,6/10^{-27}$  erg.second which is called Planck principle. That is how the biggest crisis in the history of physics took place, since for the first time after Newton’s era it was supported that the energy is not continuous, but divided into finite measurable parts. The above is considered as the principle of quantum theory.



From the new theory the following paradox emerged: the light behaved once as a wave and the other as a particle. To be more precise, it was verified that when we are looking for photons, the behavior of the light is clearly that of a wave. However, when we want to observe a photon, its behavior is that of a particle. The first signs that the material world is a lot different than the impression it leaves, were found when the researchers Geiger and Marsden discovered that the  $\alpha$  particles (helium nuclei) present quantum properties. Some years later, Bohr discovered that the electrons in the atoms of the matter can take only specific energy values, proving that the matter is constituted of quanta. The next big step was made by Heisenberg, with the new quantum theory, known as well as quantum mechanics, according to which it is impossible to measure in absolute accuracy the position and the momentum of a particle. According to the “uncertainty principle”, the more accurate we are on one measurement, the less accurate we are on the other. This theory proved determinism wrong. Since then, the “uncertainty principle” is being verified continuously in physics laboratories, introducing that the behavior of the matter depends on the measurement we make. In that way, a special relationship between the observer and the object being observed is displayed. This relationship proves the infinite possibilities of the quantum world that take place every single moment. The “uncertainty principle” means that we cannot fully decipher the structure of an object, so that we teleport it. This happens because it is impossible to measure its position and its velocity or its momentum at the same time. That way, namely, the measurement of the specific situation of an object is impossible. However, such a measurement would be necessary in order to obtain all the information needed for the creation of a similar object. The scientific solution was given in 1993, when scientists discovered a way of using quantum mechanics for teleportation in which Heisenberg’s uncertainty principle is not abolished. This property is called entanglement.

Common logic regards the objects as independent to one another. In the quantum world, if a particle interacts with another body or particle, then these two are very strongly connected. In a way, they stop acting independently of one another and can be described only when they are associated to one another, as if they were connected by a natural bond. The quantum correlation phenomenon (entanglement) applies whether the distance between the particles is one millimeter or 10000000

years of light and seems to happen instantaneously, i. e. outside space and time. This paradox is known as EPR paradox, named by the three scientists (Einstein, Pontoski, Rozen) who analyzed the consequences of the entanglement on great distances. EPR paradox as was proved experimentally as well, constitutes the base of teleportation and of quantum computers as well. John Bell replied to this paradox. Bell proved a theorem, according to which the correlation phenomenon can be detected only if we do not know the characteristics of the objects we wish to measure in advance. Otherwise the measurement results do not obey the laws of quantum mechanics. Bell's observation introduces philosophical questions about the objectivity of science, namely, what we observe is the result of the measurement. In other words, the observer affects and alters the observed and vice versa. The "subject" that observes and the "object" that is being observed form one another. One of the most interesting conclusions that arise from the correlation phenomenon (entanglement) is that the whole universe is connected in subatomic level since 14 billion years ago the whole matter in the universe was concentrated in a tiny spot. This means that whichever transformation takes place in nature, it instantaneously affects the whole universe.

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## About the nature of subatomic physics

1. Material and energy interchange one another. The material can become energy and vice versa (nuclear energy)  $E=mc^2$  (A. Einstein).
2. The particles can manifest as material or / and as waves. Something may now be acting as a particle and later on as a wave spread in space.
3. Heisenberg's Principle. We cannot define the position and the speed of a particle at the same time. We can measure one or the other. Viger supports that when we observe a particle, we affect its behavior. The observer affects and thus influences the observed.
4. What we realize as dense and impervious material is actually vacuum – There are large electron fields with minimal material / compact energy in the center. We live in a universe that is created by "objects" that are actually 99% vacuum.
5. Also, it has been observed that an object can appear from vacuum and disappear in it. It is there, and then it is not, and then there it is again. It seems that vacuum and material is the exact thing.
6. Even stranger is the fact that a particle can appear simultaneously at more than one position. The existence of a particle at 3000 different spots at the same time has been experimentally tested.
7. Non local affect. A particle can have an engagement with another, in such a way that we can affect this particle, when we influence another particle with which it is somehow connected, not physically though.
8. Quantum leaps. The Electrons can change positions spontaneously. They suddenly appear in another orbit with higher energy or distance from the nucleus.

9. Quantum fields. There is a probability field, an invisible order or quantum field, according to Bohm (Einstein's student) where all the particles and the waves interact with each other irrespectively of time and space. There is only one undifferentiated field from unexpressed yet, chances. Some perceive this field as the primary consciousness. This field is expressed as outdoor visible order or world of beings, objects and facts when we start observing it and in fact creating it by observing it through subconscious beliefs. That way, the observed "object" emerges from the quantum field and gets a specific form and measurable status only when it is observed.

- Bohr: The internal order, the quantum field or the primary consciousness
- a. All particles and waves are interconnected irrespectively of space and time.
- b. There is no space because a particle can be located on more than one spots. Simultaneously it is affected by the influences another particle gets, with which it is not obviously connected.
- c. There is no time, because time is not needed for a particle to appear at another position and it can appear at more than one position at the same time.
- d. A result does not depend exclusively on a local cause, since everything is connected in a cohesive space and time and conclusively everything affects everything and all is affected by all – inside the cohesive space and time.
- e. There are no separate beings, objects, facts or situations. When visible beings and objects are manifested, they correspond to the particular observer who happens to observe them.

## Vacuum and Material

Democritus' as well as Newton's views on atoms were based on the fundamental distinction between material and "vacuum" space. As far as general relativity is concerned, this distinction is abolished. Where there is a body with great mass, there will necessarily be a gravitational field. This gravitational field is expressed as the courtesy of the space that encloses this body. However, we should not believe that the field "fills" the space up and forces it to become curved. There is no distinction between these two meanings: The field is the curved space. In general relativity, the gravitational field and the structure or the geometry of the space are identified with each other. They are expressed by the same mathematical quantity in Einstein's field equations. Einstein says: "We are obliged to see the material as a synthesis of the areas of the space, where the field displays a special intensity. In this new type of physics there is no place for field and material. The mere reality is the field." The discovery that the mass is nothing more than a form of energy, made us radically reform our views on particles. In contemporary physics, the mass is no longer connected to the material substance, and, as a result, the particles are no longer considered as fundamental components of material, but as concentrations of energy.

The particles should not be depicted as stable three dimensional objects, as uncountable tiny balls or grains of sand, but as four dimensional beings of space - time. From the aspect of space, they look as objects that have got some mass, while from the aspect of time, they look more as evolutionary processes that request the corresponding act for their realization. The theory of quanta proved that the particles are not isolated grains of material, but models of possibilities, bonds of a non separated cosmic grid. The field theory, which is proposed by the contemporary physics, obliges us to abandon the classical distinction between space and material, since it has been proved that the elementary particles can be born spontaneously from vacuum, without the presence of nucleon or any other strong particle. The vacuum is not a vacuum! On the contrary, it encloses an unlimited number of particles that are created and then vanish constantly. In reality, vacuum is absolutely alive! Most of the contemporary physicists believe that the discovery of the dynamic character of vacuum is the most important in the history of science. Vacuum was no more a passive and neutral frame of the acting of the physical phenomena and was

recognized as a dynamic situation of great importance. “When we are healthy, we do not understand the different parts of our body, but we realize our body as an unseparated total. This understanding creates the feeling of healthiness and joy.”

## **Key Elements And Principles**

### **Material = Energy**

Material and Energy interchange with each other and we cannot separate them. The energy can become material and vice versa. The energy becomes material only when we observe it. The particles can be reported as material or waves. They can behave as particles (they can be defined in space) at one time and as waves in space at another, where it is impossible for them to be defined.

What we realize as dense and impervious material is actually vacuum. We are talking about large electron fields with little material (compact energy) at their centre. Basically, we live in a universe that is created by “objects” that are actually 99% vacuum. The sense of material arises from the move of the electrons around the atomic nucleus.

Accordingly the following applies: if the atomic nucleus has the size of a basketball, then the space occupied by the atom (with the electrons roaming) has a diameter of 22 kilometers!! Namely, let’s think that even a nut consists of atoms. Imagine how far we are from its centre...

It is very important to understand that when we say “great density” we mean “*less distance of the electrons from their nucleus*”. For example: One cubic centimeter of material near a black hole weighs 10 million tons. The rarity of the material here on Earth is immediately perceived...

### **Basic Theory:**

A particle is located at the state of the probability field, it is spread at the space, it is not found in a particular position, until it is observed by the observer and in that way it “collapses” from the probability field at a particular position.

Namely, our way of thinking creates the reality (the material i.e. as we know it) as a result of the act of observing. Every form of consciousness is defined as an observer in quantum mechanics.

### **Explanation:**

A “probability field” is a tendency to become something. It is located between an idea (a possibility) of a fact and its material realization. Namely, once everything had been ideas that were made true in such a material level that our sensory system can perceive.

### **Non - Locality**

It is possible for a particle to be located at more than one spots at the same time. The existence of a particle at 3000 different spots at the same time has been experimentally observed. The above principle applies 100% at quantum level.

Example of non – locality: Let’s suppose that we are watching a football match. When we are not looking at the football ground, the ball exists in every probable position that it could be found (probability field). Only when we look at the ball, does it collapse in one of these (positions).

The position in which the ball will collapse depends exclusively on our sensory system. They define the unique position of the ball in the field. Certainly, whoever watches the specific football match can see the ball at the same spot because all the people have got the same sensory-input system.

“Photons in love”

Two electrons that at some point had contact or were created together are indivisibly connected. Namely, if one electron undergoes a change (in whichever point), then this change “is experienced” by the other electron at the same time and regardless of the distance separating them.

**This leads us to two conclusions:**

- 1) The information that is transferred and connects the two particles is traveling faster than the speed of light or
- 2) there is no space. Namely, the particles are always together even if, for us, they are located in two different positions in space. This means that they are in different time dimension but not in different space dimension.

**Quantum Leap**

The electrons are able to change position, defining in that way, other properties and forms of the material that consist it, or they are able to change orbit towards a higher or a lower energy layer, without the intervention of time. The form and the presence of the material (as we know it in general) with its properties, are due to the two things mentioned above, namely the change of the position and the orbit of the electrons.

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## Quantum Vacuum or Zero Point Field and consciousness

The distinction between material and vacuum space was abandoned the moment of the discovery of the fact that the elementary particles can spontaneously arise from the vacuum and afterwards be absorbed by it. According to field theory, phenomena like this, take place all the time. According to quantum physics, there is no absolute vacuum and every spot of the universe is pulsing by an invisible activity.

Even at the temperature of the absolute zero, the vacuum carries huge quantities of energy which due to homogeneity is not directly perceived, but under certain circumstances leads in observable and countable phenomena. A volume of vacuum space, which is not bigger than our little finger, encloses so much energy as ten billion, billion, billion, billion universes together!

The energy of space can explain the genesis of the universe. So, the vacuum is not empty, but it encloses all potential forms of the world of particles. It seems, however that these forms are in turn transitional and temporary manifestations of the eternal and omnipresent Vacuum.

The ontological interpretation of quantum physics of *Bohm* supposes the real presence of particles and fields. The particles have got a complex internal structure and are always accompanied by a quantum wave field. They are affected not only by the classical electromagnetic forces, but also by a thinner force, the quantum potential, that is defined by their quantum field.

The quantum potential transfers information from the whole environment and provides direct, non-local connections between quantum systems. They correspond to what *Bohm* calls inherent class, which can be considered as a vast energy ocean in which the physical or developing world is a simple ripple. A universal quantum field, the Vacuum Quantum or Zero Point Field is the basis of the material world. Its explanation opens the gates to a function of deeper and more cognitive levels of reality. The catholic associations that were proved by the mildness of the radiation depth are maybe an example of non – locality. Since the early universe presented

quantum correlations, when we conduct observations and find these correlations, we find out the deep interconnection of the universe that is suggested by the quantum theory.

A “non – locality” is a non – locality either it is focused on the relatively small dimensions of the laboratory or on billions of light years. When we understand the one, we understand the other as well. However, we cannot equalize the understanding to the description of a non – locality in space and time, since a non – locality goes beyond space and time limits. As a result, it denotes a single entity that ceases to constitute a whole if it is subjected to space-time description.

## **Quantum Information**

During the whole procedure of the appearance of the particles at the universe, we have to identify the existence of a factor which is neither material nor energy. This factor is already identified not only at humanities and social sciences, but also in the physical and biological sciences.

This factor is information! This information configures the parameters of the universe at its genesis. As a result, it governs the evolution of its basic elements in complex systems. We are not talking about the type of information as it is considered to be spread among people. The “formative information” exists in the world regardless of the will of the people and their actions. The formative information of the world is connected to the laws of interrelation and interaction of its elements, which are created by the Unified Vacuum. It is referred to the consistency of the Universe through which its recipient is formed. It can be the quantum, a galaxy, or a human being. This mutual information relates everything to each other. It is the carrier of all known information under the usual definition of the term “information”.

The mutual information is a refined, permanent connection among the elements that are located in different positions in space and in different moments in time, as well as the consciousness associated with these elements. The characteristic of the coherent universe is the formative information that is created, preserved, transferred

and interconnects all its parts. In that way, a universe that searches the route from one phase of evolution to the next one, can be transformed to a system with extensive interfaces which builds over mutual information that is already created.

## **Quantum Logic**

The fundamental law of logic is the principle of bivalence: the logic (typical or symbolic) functions with an elementary binary code, for example: 'on = true' and 'off = false', it responds that is to a Boolean algebra. According to the quantum logic something can simultaneously be true and false without contradicting the natural world. This requires the need for an intuitive logic according to which contradiction and ambiguity are states of the natural world.

We could suggest that logic expresses the macroscopic world of the physical-sensible reality (visible world), while the intuitive logic expresses the tiny world of energy of elementary particles (invisible world). At the visible world of material that is perceived by our senses the binary Boolean logic functions, having as a fundamental law the principle of consistency, while at the microscopic world that is captured by the subtractive contemplation, a non Boolean logic, non-linear logical inconsistency functions.

However, the above way in which the cosmic reality is approached in its wholeness is metaphysical. Namely, it separates the world in macroscopic and microscopic level. If we wish to think as a whole, we could say that every system functions in two ways, both linear and nonlinear, i.e. both by necessity and by randomness. We could say that time unites the contrasts.

## **Imaginary Numbers and Quantum Information Theory**

Every piece of information when it is manifested at some point of the space – time continuum is transformed into energy deducted from holistic information (absolute

symmetry). Every piece of information before it is manifested into energy is being developed in imaginary and not real time. The imaginary time refers to holistic information of spacetime that refers to the imaginary numbers and not the real ones. The real numbers refer to the outcomes of the conversion of the information into energy, a process which implies the emergence of forms and shapes in the space-time continuum. Every “material point” in the visible universe has got form and shape, even if we are talking about material objects (mass) or about non material situations, facts, e.t.c.

The quantum theory is inherently probabilistic, and that happens because the necessary incision in the quantum Whole means loss of information.

The quantum probability does not constitute an expression of incomplete knowledge, but an expression of multiple realizations of microphysical capacities of a quantum system, within given experimental conditions which are defined by the intersection of the Whole at the measuring process.

Every piece of information – as “energy” that has not been manifested - is said to be developing in the imaginary time - and not in the real one. When we are talking about the imaginary time and its evolution, we propose neither a false nor a non-wise affirmative statement. On the contrary, we express a true statement; we refer to the *holistic information*, to a different time level from that of our own countable time. To analyze it further, we refer to a (space -) time level that is connected to the *imaginary* – and not the real – numbers.

Let's give an example. After we have read a novel, we close the book. When the book is closed, the subject, the characters, the meanings, the action and the whole plot of the novel in general stop existing? Of course not. We simply needed to read it. Namely, the contribution of our time and our action was needed in order for the information contained in the book to turn into content (energy), so that we read it and comprehend it. As a result, a closed book contains all the information encoded into letters / symbols on the paper. Therefore, whatever exists there (subject, plot, action, characters of the novel) are all instantaneously developed, irrespectively of whether we have read it or not.

The notion of information is connected to the entropy and is considered as equivalent to the "negative entropy". While on the contrary, the entropy is equivalent to the absence of information. The connection that seems to exist between the entropy (the degree of order in a system) and the information of that system is now well – known. We can see that their connection is inversely proportional: the weaker is the entropy (disorder) of a system, the higher is the information it contains.

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## The String Theory (1)

The theoretical physicist Gabriele Veneziano set the foundations of the Superstring Theory at the end of the 1960s. His ideas formed the String Theory. Since then, the theory was enriched, experimentally tested and presented as Superstring Theory.

The Superstring Theory at its most contemporary form composes an advanced mathematical model which describes the function of the microcosm, of the macrocosm, of space, of time, of all the elementary particles and of all the natural forces. In other words, it makes an attempt to unify everything, which is the reason why it is called Theory of Everything. However, apart from this, the theory gives a new dimension to reality... or to be more specific, many more, as it ascribes 10 dimensions to the universe (while classical physics ascribes 4 – the three dimensions of space plus time). So, we understand 4 dimensions, but there exist 6 more which have not been “unwrapped” for us!

At its evolution (Bert Ovrut, 2001), the theory presented a universe with 11 dimensions and was extrapolated to the theory of M – strings, where “M” is translated as “mother” (“the mother of theories”) or as (“membrane”) as it supposes that the strings with the appropriate vibration form membranes of dimensions capable of forming a universe! As a matter of fact, our universe seems to be floating over such a membrane of 11 dimensions, while there are more (parallel) universes.

*The String Theory aims to reach the Theory of Everything. This theory aims to unite gravity with quantum mechanics.* The Theory of Everything, however, is striking to Gödel’s theorem of incompleteness. According to this theorem, no typical closed system is consistent. Namely, no typical closed consistent system can prove its consistency. In order for a system to be consistent, it has to be in – consistent, i.e. it must have in its core the non – provability of its consistency. Only an open, i.e. non consistent system can prove its consistency.

## **String theory and ancient knowledge**

The ancient philosophy would agree with that theory while both in the East and the West, for thousand of years, the ancient wise men have been teaching the Principle of Unity which presents Nature as a whole, a unity in which nothing is separate and everything depends on everything and is connected to everything! Material and force, living and non living creatures, visible and invisible beings are nothing more but the expression of a Nature, of a Force that could easily be the TAO of the Chinese, or the BEING of Parmenides, or the Fire of Heraclitus or the ONE of Pythagoras!

The fact that the material and the forces that manifest in the Universe are nothing more than the result of vibrations, of a “cosmic music” or symphony is reported on an ancient text called “Kybalion” as well. This text was considered to be Hellenistic and mentions the 7 Principles (or Laws) that govern the universe. A more careful study has shown that these Laws are more ancient since they were found in Egypt, carved in the walls of the pyramid of Unas of the fifth dynasty (a not so famous and well preserved pyramid). The third Law of this ancient text is reported as the “Principle of Vibration” and mentions: “Nothing rests. Everything is moving, everything is vibrating.”

This Principle reminds us of the words of Heraclitus “Everything flows” with which the Greek philosopher meant that everything is continuously moving or vibrating and are continuously being transformed. Birth, change, decay and death get involved in a nonstop circle. Everything – people, plants, planets or galaxies – are born, transformed and die contributing to that infinite vibration, to that “cosmic music”. This infinite move, which is LIFE itself, is stated, among others, by the famous Chinese symbol of YIN YANG that was chosen by Nils Bohr as his symbol.

## The String Theory (2)

At school, we learned that the material is composed of molecules, which are constituted by atoms. In turn, the atoms are composed of smaller particles: protons, neutrons and electrons which as well arise from combinations of tiny “quarks”.

The General Theory of Relativity teaches us that every piece of material equals to an amount of energy ( $E=mc^2$ ) and all these elementary particles are nothing more than expressions of specific amounts of energy. In other words, what we understand as material is nothing more than energy that is vibrating at a “slow pace”.

Here comes the Superstring theory to lead us a lot further, as it describes the material, even its tiniest particles as the result of a vibration of infinitesimal cosmic strings or “superstrings”! These strings may be closed, as loops, or open as hair. A string is smaller than an electron as a mouse is smaller than the whole solar system! Theoretically speaking, such a string has a length of  $10^{-33}$  cm (!) and includes force equal to 1039 tones (!). Something as tiny as it gets is capable of structuring the universe!

According to Superstring Theory, the matter at its whole and the forces of nature are nothing more than results of the vibrations of these infinitesimal strings! It is something similar to a guitar string which depending on its voltage and the frequency with which it vibrates, it produces specific musical notes.

In that way, the Superstring Theory brings us at the threshold of the music of the World about which Pythagoras, who believed in the mathematical harmony of the universe, talked about thousands of years ago. According to Pythagoras, the Numbers, as cosmic archetypes, keep the secret of the creation of the universe and all contribute to a cosmic harmony.

### **Heraclitus prevails**

Finally, the findings of Einstein may also have put an end to classical controversy between the Greek schools of Heraclitus and Parmenides. The latter philosopher held that all is One and that motion is an illusion, while Heraclitus stated just the



opposite, namely that motionlessness is an illusion and that everything is always in a permanent state of motion and change. While the Parmenidean argument may be given some credit for using clever metaphors (from an arrow's perspective the archer is moving away), it is now firmly established that the physical world looks much more Heraclitean than Parmenidean. Even if an object appears to be at rest in a designated reference frame, it still travels through time.

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## The Fate Of The Universe

### The concept of matter in relation to the curved space-time and its geometry

Einstein's general theory of relativity supports that gravity is not a force, but a curvature of space-time. The matter deforms (curves) the structure of space – time and the bigger the quantity of the matter is, the bigger is the curvature caused. According to Einstein's special theory of relativity, the light has got mass ( $E=mc^2$ ). If we combine these two theories we approach the answer to the question about the fate of the universe. The total amount of matter influences the geometry of the universal space-time and gives the universe a specific "shape". The fate of the universe depends on its "shape".

Let's examine the above in detail:

At the equations that describe the Universe, as the Belgian astrophysicist Abbé Lemaitre proved, there is a factor symbolised with an ( $\epsilon$ ). This factor is called curvature factor and describes the type of the geometry of the Universe and its properties. Based on this factor:

A Euclidian space has got curvature  $\epsilon = 0$  and then the Universe is called flat.

A Lobatschewsky space has got constant negative curvature and then the Universe (for  $\epsilon = -1$ ) is hyperbolic (non Euclidian).

A Riemann space presents positive curvature ( $\epsilon > 0$ ) and the Universe is spherical (non Euclidian).

It is interesting to point out that according to the theory of Relativity, the curvature of space and its formation into Lobatschewsky or Riemann space depends on the density of matter that is formed in its frames.

For different values of the curvature factor ( $\epsilon$ ), the Universe is reported as flat ( $\epsilon=0$ ), spherical ( $\epsilon > 0$ ) or hyperbolic ( $\epsilon < 0$ ). As understood, for ( $\epsilon > 0$ ) or ( $\epsilon < 0$ ), the spaces are not Euclidian, nor are the according shapes, irrespectively of the dimensions, sensed by us humans.

Well, which will be the fate of the universe? The total amount of matter is very close to the “borderline” that separates a closed (spherical) world from a flat or an open one. If the universe is closed, it is only closed. If the structure of space-time is either open, or closed, this means that there is a different fate for the universe.

If the universal space-time is “shaped” as a sphere, then the universe will begin to shrink gradually and it will reach a “point” of zero radius and infinite density: a black hole. A black hole is a part of space where the matter shrinks, due to the effect of gravity and becomes so dense that the space – time wraps in a “bottomless well”. In this situation not even the light can get away. The borderline, from which neither the light can get out, constitutes an absolute barrier for any information and is called event horizon. Through the event horizon of a black hole, any communication with the known world is excluded by the rules of physics themselves, since no signal sent from inside a black hole can escape the trap of gravity.

If the universal space – time continues to expand to the infinite, then the world will experience the consequences of the second thermodynamic law: the entropy. The whole cosmic order will gradually degenerate and will reach the state of the final balance (thermical death).

The question about the fate of the universe is a mystery.

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## **The Geometry Of The Universe**

When we refer to geometry, it goes without saying that there also exists a space where it develops and the properties that this geometry describes.

In maths, in the world of mathematics, the meaning of space is ideal – notional and has nothing at all in common with the material reality. Respectively, the geometric shapes that are formed inside the world of mathematics are ideal – notional and dematerialized and are not at all related to the material reality that our senses perceive. The shapes and the forms that are designed inside these mathematical spaces are identical to the 4 Platonic solids: the regular octahedron, the regular icosahedron, the regular tetrahedron and the regular cube or hexahedron.

### **The Dimensions**

The physical man has got even a poor sense of these non material spaces and of the forms that are created inside him. He identified these non material spaces to the material shapes that were perceivable by the human senses. He named “three dimensional space” the material space that the human senses can perceive. Inside this three dimensional material space he identified the two dimensional space with every material level, for example, the surface of a table.

Likewise, he identified the single dimensional space with the section of two material levels, for example, the edge of a cube. In that way, the false impression that one three dimensional material space includes in itself infinite spaces of one or two dimensions was created. In the same way, a two dimensional space includes infinite spaces of a single dimension and a space of a single dimension includes infinite spaces of zero dimensions.

This identification, however, is false! Every spot around us, inside the material World, is described by three coordinates. This means that, according to the definition we gave above, the spot is not a space of zero dimension, since it can be described by three coordinates. However, as it is known, every material level or straight line, is a

set of three dimensional spots and therefore they are described by three dimensions as well. Namely, they are three dimensional shapes that have nothing in common with the respective spaces of two and single dimensions. Inside a three dimensional material space we can distinguish curved surfaces as well, like the spherical, the parabolic or the hyperbolic one. So, these surfaces are three dimensional since they are consisted of three dimensional material spots.

## **The Non Perceptible Universe**

If the dimensions of the universe are more than three, even if the geometry of the universe is Euclidean, humans cannot perceive the real nature of the four dimensional universe, nor the forms and shapes that are created inside it. Namely, everything that he perceives as real, even the whole universe, is nothing more than projections (depictions) of parts of the non Euclidean real and non perceivable universe, on a three dimensional Euclidean world which is constructed by the biology of the human senses. We scientifically name the World constructed by the biology of the brain pseudo – Euclidean Minkowski space.

As we mentioned above, the purely mathematical spaces, and the geometric shapes that are formed inside them, are ideal and non material and have nothing to do with the material reality. Mathematics study ideal spaces, “unreal” and non perceivable ones, while Physics studies the material, perceivable and measurable World. The connection was made by the well known Theory of Relativity by Einstein, who conceived the idea that the main composite of classic Physics, the material, is nothing more than curving of the main component of the World of Mathematics, the space that is.

## **The Space - Time Continuum**

The only real thing inside the universe is the space - time continuum, which cannot be cut or divided. Namely, if we make a section on the space - time continuum, we

have space and time, but neither the time, nor the space that is counted by the human describe the universal reality. Briefly, time as described and counted by clocks and space as described and measured by the units of measurement have nothing in common with the reality of the universal creation, nor do they describe it.

## **How Can Material Be Defined?**

According to the Theory of Relativity, the material is a curved three dimensional space. However, the three dimensional space is a delusion; the material is the curve of a delusion.

When we talk about the curving of the Euclidian three dimensional universal space that is perceived by our senses, we simply mean a curvature of space in relation to the third dimension, the dimension of time. In fact, the perceivable material is a curved three dimensional space towards the dimension of time. That means that the material is perceivable if the value of the dimension of time is located between a minimum and a maximum.

The variation of the curvature of a region of a three dimensional space marks the birth, the evolution and the death of a material existence. If we consider stable the extent of a region of space, the amount of the curvature of space in relation to the dimension of time is the basic parameter that characterizes the evolution of a material existence. The Curvature of a region is equal to the density of the energy. This means that instead of saying that the material is the curving of space, we can say that the material is a region with a great density of energy. Namely, it is equally right to say that the evolution of a material existence depends on the changes in the density of its energy.

## The Elusive Concept of Time

Time, before the advent of the theory of relativity, had in fact a meaning. Now on, in the period after the theory of relativity, time has not got a single meaning any more, but a logical coupling of two meanings – these of space and of time as space - time. Namely, when we want to refer to the meaning of time, we say that time is inextricably connected with space, and vice versa, space is inextricably connected with time. The result of this forced coupling is catalytic because basically the meaning of time (and the meaning of space of course) is from now on defined by another meaning – that is, it is like understanding time through space (and vice versa).

In that way, however, both those two meanings, space and time, seem to be disembodied. As far as space is concerned, it can easily be understood, since its three dimensions have always been visible. But, what happens with time, whose indirect perception has always been problematic? Now, the only traces of time that are left are two: an outer (the fingers of the clock) and an inner one (the persistent feeling that we have concerning time). In other words, back in time there used to be a universal clock, which was perfectly tuned by God. But now on, time is tuned universally, but conventionally by Greenwich.

We have now reached the point where time has been transformed into a “ghost”. On the contrary, due to the degradation of time which we are talking about, space gains accretion, resulting in it being more flexible both in its meaning and in its content. For example, the scientists who study the above theory are talking about a transformation of space into something geometrical – curvature of space -. That is how the meaning of gravity has occurred. But, the phenomenological concept of space - time as a single entity gives accretion to the meaning of space against the meaning of time. We can show, for instance, in what way a clock located on the highest floor of a building is accelerating, while on the contrary a clock located on the lowest floor has got a lower speed. Another example can be a withe which seems to be smaller in length when its speed goes up concerning the observer.

We are showing, in fact, time as an elastic figure and a reality non stable and rigid. It seems, namely, that space and time are quantities that are being affected by bodies

and forces. A body on the move and a force empowered have an effect in space and time and this transforms their curvature. This works vice versa as well, the curvature of space and time affects the way in which the bodies move and the way in which the forces act. Space and time not only affect, but are also affected by whatever takes place in the universe. The curvature of space - time leads to the perception of a universe finite and infinite at the same time.

Well, since time is relative and depends equally on the gravity field where the observation is taking place and on the speed of the body being observed, the only stable meaning that we can attribute to it, is its flexibility. But, in fact this flexibility is nothing else than the strain of space. Besides, when one part of a double (and reversible) being becomes relative as a size, the same thing happens directly versa to the size of the other part. Namely, as one part, time, becomes relative, the other one, space, becomes absolute. This is the condition or requirement in order the space - time can be a piece of information. Space is the piece of information, while time is its entropy when the symmetry of information is broken. We, as human creatures, move in its space - time.

## **Time, Entropy, Brain**

In the frame of the universal space-time continuum, time is relative and as a consequence space is absolute. How does this reverse ratio lie in the eyes of an observer? The answer can be divided into two parts:

a) The reverse ratio, in the eyes of an outer observer would seem like an expansion of space. b) On the other hand, a participatory observer would experience this expansion of space through the growing of his own age. Consequently, a conscious and self-aware observer would observe the expansion of the universe on the one hand, and on the other he would measure the decrease of his own time.

These parallel processes, if examined on the basis of their phenomenological intuition, are presented as relational: increase of the disorder (or uncertainty) degree, which is an entropy increase, both as a behavior of the universe (expansion) and as



a behavior of the biological body towards its growing up. But, by eidetic reductions, we can draw other conclusions.

1) The expansion of the universe, namely the increase of its entropy, is not connected with the increase of the entropy of the material factor of human existence. This happens because growing up takes place due to a decrease in space - time – and consequently in the entropy of the material body, while in the case of the universe, the expansion takes place due to an increase of its space. So, poetically speaking, while in the sky there is an increase of the entropy, on Earth we can see a decrease of it, at least on the part in which the living bodies are concerned. As a matter of fact, the increase of the entropy in the expansion of the cosmic space - time is inversely proportional to the entropy on the earthly scale of space - time.

2) This consequents directly (and indirectly) to the independent behavior of the human brain, which –always in an earthly scale of space - time –slightly increases its entropy, even though the whole material body tends towards disorder. So, the brain is driven, through the increase of the energy of the rest of the biological body, to the creation of more and more information. It has to be seen that the entropy, namely the consumption of energy is itself inversely proportional to the information inside the earthly space - time: higher entropy, lower information and vice versa.

3) Well, it seems, that the brain, as a piece of information, is a part of the cosmic space, while as energy, it takes part in the increase of the entropy that is taking place in the earthly space - time. Maybe, in this way, harmonizing the earthy with the heavenly, the phenomenon of life is adjusted catalytically.

4) Finally, if the above indeed takes place, the participation of consciousness (in its broad meaning) in the expansion of the cosmic space, which as analyzed here is nothing else than the fluctuation of space - time from the illusion of time, i.e. the visible universe, towards the truth of timeless time, namely the invisible universe

## Mathematics Of Imagination

“Logic will get you from A to B imagination will take you everywhere” Einstein.

The genuine mathematics –as Kurt Gödel showed - can be classified in absolutely no Formal Axiomatic System, no matter how advanced that system is. They cannot be formal; they are by default informal (non typical). The logical assumption is then, that there cannot be a (formal) mathematical theory. Therefore, the nature of genuine mathematics is not objectively “mathematical”. Namely, it is not governed by the logic of set theory.

The logic of the set theory is governed by the principle of identity, the principle of non-contradiction, while the choice of their axioms is strictly poetical, that is “creative”. The choice of the axioms is not empirical, nor are they produced logically, because if it were so, they would not be axioms, they would be theorems of logic. So, mathematics is not a simple acceptance of logical principles and metamathematic rules. If there is no creation of new axioms, where there is a need of them, then mathematics stop developing. There is no restriction on the choice of the axioms, except for the non-contradiction and their sufficiency. However, those two principles are not enough for the creation of axioms. They are the negative terms that have to be abided for the axioms to be valid and acceptable. The mathematics of thought exceed the totals and deal with magmas. For example, all the pictures that we keep in our minds when we are thinking or dreaming do not form a set in mathematical terms. That is because a set consists of elements defined and distinguished from each other, which come either from the real world or from the notional imaginary world. Our pictures, however, do not consist of elements distinguished and defined. We cannot separate them; all elements are connected to each other and are defined mutually.

Only the linguistic expression of genuine mathematics is typical, since, as being a language, it is a human construction of symbolic/point patterns which express the earthly dimensional (Euclidean) space-time environment. These extreme spot symbols of mathematical expression are nothing else but the extreme sections of the net (intangible) mathematical universe. Namely, they are material thickenings that take place due to the function of the human brain (1). An example may analyze the

above: as electromagnetism is material (electricity) and “power” (“something else”) altogether, the mathematical universe is language (material) and thought (“something else” – “energy”) together. The language should not be coincided with thought (2).

On the other hand, neither the thought should be coincided with the written language. Both the oral and the written language are nothing more than a form of the net structure of thought – logic. Logic in turn, should not be coincided with mathematics (neither as being a mathematical logic), because mathematics are an immaterial – invisible “language” which is expressed as a visible material through mathematical symbols – spots. Ultimately, Mathematics themselves cannot be categorized, as we showed, in rationalism or in empiricism (“sensualism”), or in intuitionism (“intuitive mathematics”) either. They refer directly to the queen of human capabilities in Communication, i.e. imagination (and the Imaginary).

“Imagination is more important than knowledge. For knowledge is limited to all we now know and understand, while imagination embraces the entire world, and all there ever will be to know and understand.” Einstein. As Hegel said, desire is the matrix of Thought. Man desires what he lacks and what he lacks is the “other”, the unseen and invisible world. Man imagines what he lacks and he creates it with imagination. “Nothing exists in thought if man has not imagined it” (Aristotle). Creativity, creative imagination (Kant) is the ability to create new ideas, forms and situations from void and nothing.

“Imagination is the queen of truth, and possibility is one of the regions of truth. She is positively akin to infinity”. Charles Baudelaire

As Baudelaire said, imagination is the queen of the human capacities. Indeed, reality is unified with the imaginary and the image we create for something is more important than that thing itself. However, imagination does not only create images. It also creates wishes and provocative excesses. Unquestionably, both the greatest and the most awesome human accomplishments were born in his imagination in the first place. We need imagination in order to “touch” others and spread ideas strange or even annoying to them. Imagination is required in order to surprise, to satisfy and to move them. Imagination means communication and creation after all.

Furthermore, communication is the creation of the imaginary; it is an address to the imagination. This explains why communication is creative in more than one ways.

Imagination, then, is necessary to Communication, because beside the creation of images, words, meanings, universe, wishes and dreams, it also results in offering the pleasure of knowledge or the knowledge of pleasure to the world... It offers that is, mathematical imagination itself!

1. According to the special Theory of Relativity, the material universal reality is nothing more than the projection, the image, the reflection of everything enclosed in the four dimensional non Euclidian and invisible universe. The fourth dimension is the projection to the four dimensional and Euclidian space that is created by the physiology of our senses.

2. The language must not be identified with the Thought nor must it be distinguished from it, as the visible world of the perceptible material is not identified nor is it distinguished from the invisible world of the super noticeable energy. Time is the rhythm that combines the opposites without identifying them.

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# **The End of Certainty - From Being To Becoming**

## **Complexity And Self-Organized Systems**

The Newtonian mechanics was the model of classical science. In the classical science all the natural laws had an absolutely deterministic and descriptive character and defined the course and development of every phenomenon. The knowledge of these laws assured the human – observer the ability to understand not only the present but also the past and the future. In a deterministic and timeless universe, the arrow of time is nothing but a human illusion. Only the vision of the universe from the perspective of eternity ensures the truth of physical theories.

In the deterministic universe of the classical science, the order always creates disorder and never vice versa! The scientific dream of a united (applying on the microcosm as well as on the macrocosm) and objective (i.e. independent of the observer) description of the natural world, would become the nightmare of the contemporary physics in the beginning of the 20th century. The quantum description and interpretation of the microcosm, which is regarded as the fundamental level in which all the natural phenomena are raised and explained, requires a radical review of not only the classical description but also of the metaphysical preconditions of classical science.

The classical ideal in physics was to be able to predict with certainty the future development of a physical system. Newton's mechanics led to the triumph of the deterministic vision of the natural processes: if we know the initial conditions of a dynamical system, then the solution of the differential motion equations would allow us to know in certainty not only the past but also the future of that system.

This, however, is not feasible for two reasons: a) it is not possible to have the initial conditions of the system in absolute accuracy and b) the analytical solution is not feasible for the great majority of the systems. As far as the first reason is concerned, we have to mention that after the discovery of the unstable systems, it became clear that very neighboring orbits (which, namely correspond to initial conditions and whose values may differ slightly) after a certain period of time are removed

exponentially. In this notion, the orbit is actually an idealization, since it is never possible to know the initial conditions in “infinite” accuracy. According to Heisenberg’s uncertainty principle and Bohr’s principle of correspondence, the neutral and deterministic description of the microcosm is impossible: discontinuity and indeterminacy are inherent characteristics of microphysical phenomena and in order to describe them we have to integrate the observer within his own observations!

Prigogine believed that the laws of nature and those of physics are not given a priori, nor are they entailed logically. They evolve in the same way the various species evolve. Since things are becoming more multiple, bifurcations and aids occur and new laws appear. “How can you be talking about the laws of biology if there are no living systems?”

This proves the creativity of life. Each level of organization produces something fundamentally new, something that is not found in the constituents or the "parts" of the previous level. For example, in a mixture of hydrogen and oxygen there is no water. The mixture gets a new identity, which, in practice, sacrifices the "parts", hydrogen and oxygen. The only way to get the parts back is to ruin the water.

In other words, it was not obvious in the equations of quantum mechanics that a “quantum arrow of time” emerges. Prigogine notes that in the theory of relativity as well, time is irreversible and space and time are alternating mutually. This theory led to the formulation of the theory of Big-Bang, which in practice gives an irreversible sense to the history of the universe.

**Prigogine’s first challenge concerns the phenomenon of irreversibility. The second challenge has to do with the sense of simplicity.**

Since Democritus and Aristotle’s era, scientists believed that beneath the complexity of our world there should be simple objects and simple forces. Initially, scientists

thought that the atoms are the simple structural stones. Later on, when it was discovered that the atoms consist of smaller parts, simple particles such as the proton and the electron became the structural stones. After that, when the quantum mechanics led to the unexpected discovery of an impressive world of particles at the subatomic level, the physicists invented the grand unified theory and began to look for the unique, simple power - the "superpower" which is supposed to have given birth to that number of interactions of elementary particles. Prigogine points out that: "the idea of simplicity dissolves. Whichever direction we chose, there is complexity."

Complexity is the key idea for the understanding of his theory. According to him, an organism is born, grows to its maturity and passes away, namely, it has a history... Both the classical Newtonian physics and the physics of the 20th century with quantum mechanics and the theory of relativity, are expressed by equations, which are symmetrical with respect to time, i.e. they are reversible and deterministic. In those theories there is no discrimination between the past and the future.

Thermodynamics, from approximately the half of the 19<sup>th</sup> century had posed the problem of the irreversible processes and the arrow of time. But the fundamentally nonlinear character of natural processes and the different behavior of natural systems, when they are away from the equilibrium state, were not yet recognized. The discovery, in the 19<sup>th</sup> century, of the non reversible time – in evolution and entropy - did not change the belief of the physicists that in the most basic levels of matter, time is reversible, while the irreversibility we can see around us is a kind of an illusion, as Einstein once pointed out.

As Prigogine mentions, "the study of systems away from the equilibrium state led me to the belief that this cannot be the right view. Irreversibility plays a constructive role. It creates a form. It creates human beings. How could our simple ignorance of the initial conditions be the reason for this? Our ignorance cannot be the reason we exist."

Prigogine goes on: "If we could raise the knowledge, i.e. create a computer powerful enough, in order to write equations for the motion of all reversible and probabilistic individual molecules that compose a system, then would our ignorance disappear,

would the illusion of irreversibility remain vague, and would life, evolution, death and time itself disappear? This is weird.”

This time paradox resulted in the development of physical theories during Newton's era and thereafter. Particularly the time paradox refers to the fact that while the classical equations are reversible with respect to time, from numerous physical data the arrow of time seems to exist.

So, the question raised by Prigogine is the following: Does the arrow of time arise simply as a result of a phenomenological approach to the natural processes or does it represent a fundamental element which we must incorporate in the descriptions of these processes?

The claim of Prigogine is summarized: “All laws of physics must be compatible to the existence of the arrow of time”. This means that the laws have to be redrafted in order firstly to contain the arrow of time (i.e. not to be symmetrical with respect to time) and secondly, the various levels of description can lead to the same future state.

## **The Role Of The Dispersing Structures And Of The Bifurcations.**

According to the second law of thermodynamics, in an isolated system (i.e. which does not exchange matter and energy with its environment), the total entropy increases progressively, while the free energy decreases until the system reaches the equilibrium state, when its entropy acquires its maximum value. In thermodynamic equilibrium state, the system is homogeneous and idle. If we also suppose, as Clausius did, that the whole universe is an isolated system of gigantic dimensions, then, according to the second law, the progressive degradation of the energy, i.e. the maximization of entropy inevitably leads to the "heat death" of the universe.



In classical thermodynamics the arrow of time, i.e. the decay, the disorder and the death, is introduced. Classical thermodynamics referred to isolated and closed-linear systems.

However, how can we explain the “weird” behavior of the open systems? These systems are located far from the equilibrium state and continuously exchange matter and energy with their environment. They do not tend to a state of minimum free energy and maximum entropy, but, on the contrary, they use some energy inputs and fluctuations not only in order to maintain their structural stability but also in order to evolve towards new dynamical states.

The open thermodynamic systems are the rules, not the exception. Those systems contain not only the living organisms and the human societies, but also the greatest part of the “simpler” physicochemical systems. Prigogine proved that on conditions away from thermodynamic equilibrium state, the matter acquires new unexpected properties, organizes itself and produces complex structures from random fluctuations.

He will name these structures dissipative structures. Basically, we are talking about systems which consume energy. The dissipative structures are states which reflect their interaction with the environment, with which they interchange energy, sustained through an endless dynamic flow.

The simplest forms of dissipative structures are some rather simple physicochemical systems in which minimum disturbances and fluctuations in microscopic scale lead to the emergence of new unexpected macroscopic structures. The living systems are open systems, organization complexes that are far from the equilibrium state and Prigogine, as it is said, classifies them in the “dissipative structures.”

Prigogine mentions that these random (unpredictable) processes show that the open systems and therefore the greatest part of our universe are not mechanistic but random. He uses the idea of randomness in a more different manner than the other scientists do. For example, for Jacques Monod, author of the book “Chance and Necessity”, chance means a world governed blindly and implies a universe, which

according to human terms, is meaningless, namely it is very close to the illogical world of existential philosophy.

However, for Prigogine, chance is a synonym for non-determinism, for spontaneity, for innovation and creativity. Prigogine's universe is not far from being a living organism, just because it has got space for the random behavior. This allows the dissipative structures – which can be anything – from a chemical solution to a cloud, a brain or a human – to recreate themselves according to unpredictable models. These new models are usually caused by small changes or disturbances. These small changes or disturbances create an unpredictable type of behavior which challenges a mechanical interpretation of entropy, as well as a conventional interpretation of the arrow of time.

This way, the dissipative structures introduce continuous creativity in nature. This means that nature is not something stable, inert molecules that are governed only by impulses and attractions, but something energetic and alive. In those open systems, the matter is not isolated, but on the contrary it is rewarding, and correlative self - changing, with respect to the activities of the rest matter. In those "out of balance" systems, the minimum change can "destabilize" the system and bring about a result that has not been foreseen by the logic of linear equations.

## **Examples of dissipative structures**

The key to the answer to the time paradox is located in the study of systems that are far from the equilibrium state. In systems like that self - organizing processes as well as dissipative structures are possible to come out.

In order to understand this meaning, at first we shall refer to a system which is located close to the equilibrium state, e.g. a pendulum with frictions. If we remove it from the equilibrium state, after a certain period of time it will return to the above state. However, in systems which are not far from the equilibrium state, there are bonds which do not allow them to return to the equilibrium state. Prigogine mentions

the ecosystem on the surface of the earth as an example of the above phenomenon. As the ecosystem gets the influence of the solar radiation, it is removed from the equilibrium state and it leads to the creation of complex structures. “The important thing”, Prigogine mentions, “has to do with the fact that away from the equilibrium state, when the system is disturbed, there is no guarantee that it will return again in its former condition. On the contrary, the system starts exploring new structures, new types of organization in space - time, which I named dispersing structures.”

## **Bifurcation: Window of divided routes**

An important factor in the emergence of new structures is the contribution of fluctuations or disruptions, namely of sudden illusions that allow something new to appear, even there where the existence of entropy would exclude it. This happens because the dispersion structures are non linear systems, the order of which emerges from chaos. If we add only one fluctuation to other fluctuations, then this fluctuation will become so strong that it will manage to organize the whole system under a new model. These points are called by Prigogine Bifurcation points and they are points at which the deterministic description collapses and then the system follows one of the several possible Bifurcations of the road.

As an instant window into the whole, the strengthening of the bifurcations leads to order or chaos. In Prigogine's perception of things, the bifurcation – a word meaning Point of disunity or division – is a basic notion. The bifurcation in a system is a moment of critical importance when something as small as a single photon, a slight variation of the external temperature, a change in the density, or the fluttering of a butterfly in Hong Kong expands so much by repetition that a fork is created – and the system gets a new direction. As time goes by, the torrents of Bifurcation points makes the system either get fragmented resulting in chaos or stabilize a new behavior through a series of feedback loops (like self – abolition, cross catalysis and self – interception).

If a system that has gone through a Bifurcation gets stabilized by its feedback, it can resist to other changes for millions of years, until some new critical disorder enhances the feedback and creates a new Bifurcation point.

At its Bifurcation points, the option to “choose” between different types of order is actually offered to the system. The inner feedback of some choices is so complicated that there is basically an infinite amount of degrees of freedom. In other words, the order of the choice is so high that we are talking about chaos. Other Bifurcation points offer options where the coupling feedback creates a lower degree of freedom. These choices can make the system seem simple and normal.

This, however, is a fraud because the feedback in obviously simple orders, such as a solitonic wave, is also very complicated.

The pure effect of the Bifurcations in the evolution of the living cells was the creation of organic chemical reactions that have been created in a complex and stable manner in the cell environment. Prigogine by the notion “communication” means this exact creation of feedback loops. Towards such communication the system remains unharmed.

The Bifurcation points are landmarks in the evolution of the system and imprint its history. The historical record of the human Bifurcations is engraved on human fetuses. These undergo stages on which initially they look like fish, later like amphibians and finally like reptiles.

Thousands upon thousands of Bifurcation points that compose a vivid recounting of options, through which we evolved as a system from the initiative cell to our current being, can be found imprinted in all forms and processes – in our cell chemical reactions and in the form of our neural networks - that make us unique. In every Bifurcation point during the past of our system, there was a course in which there were several futures. By the repetition and the support that the system got, one future was chosen while the other possibilities disappeared forever. This way our Bifurcation points compose a map of non reversibility of time. The dynamic of the Bifurcation points reveals that the time is irreversible but it is able to make summaries. It also reveals that the movement of time is not measurable. Every

decision made in a Bifurcation point contains a support to something small. Although causality works every time, the Bifurcation occurs unpredictably.

Prigogine points out that: "This mixture of necessity and chance composes the history of the universe." It also composes the creativity of the universe. The capability of a system to reinforce a small change constitutes a creative lever. Only one bee which enters a beehive and interacts with thousand other bees can pull the beehive across the air by making small movements that indicate the location rich in pollen. The systems are also very sensitive near those parts which consist the crystallized "memory" of Bifurcations of the past. The nations evolved mainly due to Bifurcations which included heavy conflicts. As a result, they are very sensitive towards several types of information which reproduce those Bifurcations. A mere newspaper title can motivate a whole nation to go to war.

## **The role of the Bifurcations in the evolution of life.**

The belief that the secret of the creativity of nature hides in the laws of unpredictability, chaos and time and not in the mechanistic laws of classical dynamics lies beneath Prigogine's claims. He mentions as an example of the creativity of the chaos and of the non reversibility, their role in the emergence of life.

The dissipative structures arise as a result of processes in systems which are characterized as releasing systems, i.e. systems that show energy losses. In such systems, when they are away of the equilibrium state, interactions (long-range correlations), which have a long range and play a crucial role in creating new structures, take place. The appearance of life in our planet became possible through such natural processes.

## Self – Organising And life

An example of self - organising is the appearance of currents and eddies in fluids where we can see billions of particles “cooperate.”

The matter is blind near the equilibrium state. However, far from the equilibrium state we have correlations of great range that are basic for the creation of new structures. Self organizing takes place because when we are far from the equilibrium state, the system has got lots of choices, of which, anthropomorphically talking, it selects one.

Self – organizing is closely connected to the phenomenon of life. The creation of complexity, which is necessary for the creation of life, is connected to the process of storing information in molecules of which the living cell is constituted. All living systems, either unicellular or multicellular organisms, are extremely complex systems compared to all the other species of the non living matter that exist in the Universe. Complexity is the result of effect processes, leading to systems with great organization, containing large information stocks. This organization of the molecules of a living organism, a result of accumulation of information, is what makes them able to produce useful work. The useful work involves both the fulfillment of basic biological processes, such as metabolism and reproduction, and the further increase in the information content that builds up in living systems. This last process is subject to the great chain of evolution of biological systems, this development is governed by the law of natural selection. The capability of reproduction, mutation and metabolism are necessary conditions for the latter.

A system which has got these properties automatically is able to take part in the “game” of natural selection and evolution. The natural selection leads in forms of organizing, which are more effective, leaving the less effective ones at the process of disappearing. This way, a form of organizing which is stabilized dynamically in a system out of the equilibrium state, will disappear, if a an improved form of organizing appears. In this sense, progress means constant amelioration of the operational efficiency of the biological systems.

A yet unsolved problem, associated to biological order is the way in which the transition from the molecular activity to the supermolecular order of the cell takes place. The biological order was usually considered as a natural condition which was created by enzymes playing a similar to the demon of Maxwell role, maintaining chemical differences in the system. However, today, it becomes understood that this role is ensured by the genetic information contained in the nucleic acids and is expressed by the creation of enzymes which ensure the perpetuation of life. The enzymes thus contribute to the prolongation of life and postpone death. Namely, life is not located out of the natural order, but appears as the ultimate form and expression of the self organizing processes.

## **Creative Chaos**

By focusing on the role of chance and chaos at the creation of structure, Prigogine pictures a universe in which the objects are not defined as well as they are defined in classical or quantum physics.

In Prigogine's universe the future cannot be defined because it is subject to chance, fluctuation, and support. This is characterized by Prigogine as the new "uncertainty principle".

According to the famous uncertainty principle, which was expressed by Heisenberg, it is impossible to know in absolute accuracy the position and the momentum of any subatomic particle. Prigogine's new uncertainty principle teaches us that beyond a boundary point of complexity, the systems are directed to unpredictable directions.

The systems lose their initial conditions and cannot obtain them again or reverse their course. Their inability to look back in time is an "entropy barrier". The discovery of the entropy barrier is similar to Einstein's discovery that the human beings and the messages cannot travel faster than light, namely, beyond the "light barrier".

Prigogine's uncertainty principle, just like Heisenberg's uncertainty principle, is a damage against reductionism (raising all phenomena to simpler ones). But for Prigogine, this way of viewing nature does not reduce its capabilities, but it recognizes its creative possibilities.

Even when we see a system moving to chaos, points – situations, in which order emerges, appear in that system.

Similarly, inside chaos there are traces of a peculiar order. It is also possible that where the system has the shape of a stable system areas called "windows" or "islets" appear. These areas oscillate around a certain number of values. These islets of order, which are interposed into the areas of chaos, are called intermittencies. The importance of these "islets of order" is great because it indicates that there is a close relationship between order and chaos. The relationship between order and chaos must be due to a single process which is subject to the dynamics of nonlinear systems. Namely, there has to be a global chaotic attractor. Generally, the correlation between order and chaos is taken for granted and reflects a holistic concept for the operation of Nature.

## **Is Time Ahead Of The Being? The Pre – Universe**

Two of the biggest questions that preoccupied philosophers and scientists of all time, are the following: a) does the world (the universe) have a beginning or is it infinite? b) does time have a beginning? It is proved that these questions are not independent of one another. The second one refers to the topological characteristics of time. The problem of the nature of time is connected to the above.

For Newton, time is absolute and independent of the history of the Universe. This abstention has now been rejected. Today we accept that the Universe was somehow created, namely it has got a starting point.



In this point Prigogine wonders: “However, how can we realize this starting point (of the time)? It seems more logical to me to suppose that the birth of our Universe is an event in the history of the world and as a result we owe to attribute to it (to the world) a time which comes before the birth of the Universe.”

But how does he mean this birth of the world? “This birth could have been similar to a change of phase which leads from a pre – Universe (that is also called “quantum gap” or “next universe”) to the Universe that is being observed and surrounds us.”

Prigogine goes further explaining the known theory of Big Bang: the Universe begun from a singularity, a point which enclosed all the mass and the energy of the current Universe. But we do not have a theory able to describe this point abnormality. However, many scientists consider the beginning of the history of the Universe, as the beginning of time.

Subsequently, Prigogine poses the question: “Does actually time have a defined beginning or is it infinite?” and he goes on: “We cannot support that we hold the definite answer, but our phrasing of the laws of Nature, through probabilities and not certainties, can contribute towards this direction. Our research will follow a different way of the one followed by other scientists. We suppose that the Big Bang is an eminently irreversible process. This irreversibility would occur as a result of the instability of the pre – Universe, an instability which is caused by the interactions between gravity and matter. Inside this perspective, the universe would have been created with the characteristic of instability. Meanings, which we have mentioned, as self – organizing, would likewise be applied in the early stages of the Universe”.

It is known that Einstein believed that the discrimination between the past and the future is an illusion because the equations of the, until then, known theories were symmetrical according to time. K.Godel extended this idea to the end, suggesting a cosmological model in which it was possible for someone to travel into his own past. Einstein, who was concerned a lot by this, eventually ended up in expressing his ideas on such an extreme thesis, supporting that it would oblige physicists reconsider their beliefs on the problem of non reversibility.

Hawking, on the other side, introducing the notion of the imaginary time, reached the point of expressing the belief that at the first stages of Big Bang, space and time could not be discriminated from one another and time obtained the characteristics of space. Prigogine, however supports that “time is eternal. We all have an age, our culture has an age, the Universe has an age, time, however, has neither a beginning nor an end.”

Namely, since the Being, the Existence is meaningful only from the moment the Universe started existing and since, according to Prigogine, time is eternal, then time came before the Being.

Einstein, by the General Theory of Relativity and the field equations, linked the measuring of space-time to the total amount of matter -energy of the universe, namely he showed that the geometry of space – time is affected by the matter – energy, and the moving of the material objects are defined by this geometry. The solution of the field equations, which was suggested by Einstein, matched to a static Universe, thus a universe without a history, according to the classical ideal, which contained the reversibility of the processes, and therefore, the symmetry towards the time of the past and the future. Later on, Friedmann and Lemaitre showed that such a universe is exceptionally unstable and it may be damaged by the slightest disturbance. Eventually, we have reached the acceptable standard model of the Big Bang, which is firmly supported by critical experimental data, such as the experimental verification of the law of Hubble and the background radiation of 2.7 K.

According to this model, as it is reported, the Big Bang began from a point defect, wherein the density and the curvature of space-time are infinite. The size scales involved in this history of the Universe, are measured according to the fundamental physical constants, i.e. the world gravitational constant  $G$ , the speed of light  $c$ , and Planck's constant  $h$ .

The elementary aggregates calculated by those constants are the following:

- (1) Planck's length, which is  $10^{-33}$  cm.

(2) Planck's time, which is  $10^{-43}$  sec.

(3) Planck's energy, which corresponds to a temperature of 1 ~ 2 Kelvin grades.

(4) Planck's mass which is  $10^{-5}$  gr. It is huge compared to the mass of the elementary particles. (e.g. proton mass is  $10^{-23}$  gr)

During the first moments of the Universe's life, what is called Planck epoch (or era), these orders of magnitude dominated. Prigogine, considering that in that epoch the quantum processes, along with gravity, should play an important role, introduces, in that point, the necessity of quantization of gravity, and consequently of space – time. This attempt has not yet delivered the expected results.

Concerning the model of the inflationary universe, Prigogine underlines that “the results are very interesting. They show a possibility of an irreversible process that transforms gravity into matter. They also focus our attention on the pre – Universe, which would here be Minkowski's vacuum, a starting point of irreversible transformations. We shall stress that this model does not describe a process of creation from the beginning. The quantum gap is already characterized by the universal constants, and hypothetically, we can attribute to these constants the values they have today.”

In an other point of his work, he writes: “the substantial point here is the fact that the birth of our Universe is not yet connected to an abnormality, but to an instability, similar to a change of phase or a bifurcation.” And by stressing on the ratio between geometry and matter, on the one side, and on the equivalence of the mechanical work and the heat on the other, he proves the importance of the second thermodynamic law, which “breaks” this notion of equality: the mechanical work can always be transformed into energy, but not vice versa. The case of space – time and matter is equivalent: the transformation of space – time into matter correlates to an irreversible release process, which produces entropy. The reverse process, which would transform matter into space – time is excluded. Namely, the birth of our

universe happened due to the transformation of space – time into matter and is interpreted in an explosion of entropy.

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# **The Paths Of Knowledge - Ancient Knowledge And Contemporary Physics The Universal Nature Of Soul**

Pythagora's cosmotheory supported that spirit is the matter of the world and it is subject to a mental set that expresses the Universal Divinity.

The "Universal Mind" (or the global consciousness as it is differently called nowadays), namely the totality of all the actions and thoughts, is what creates reality around us in the same way quantum physics teaches us that the observer chooses his reality among an ocean of probabilities the moment of the observation, i. e. at the act of thought.

If we examine the beliefs of the ancient Greek philosophers and we compare them to the contemporary scientific thought, we will find that the "kinetic principle" never appeared; it is a law that has always existed and its substance is plain energy. This transcendent "principle" is completely immaterial; it is the absolute Spirit that defines the quality of God.

What is, however this eternal energy of the "kinetic principle"? According to Aristotle, it is the plain cognition of itself. The Universal "Mind" understands itself, when the Divinity "meditates herself". We are talking about "cognition of cognition". And since the human, according to Aristotle, is the only Being that takes part in the spirit of creation, we are able to support that when he realizes the united existence of the universal mind, only then will he have conceived the notion of God.

Anaxagoras is the first thinker in the history of world that separated matter from spirit, the souled from the soulless and supported that the cosmic "Mind" includes all the laws that express the activity of God.

For Anaxagoras the word Cosmos means "order in the cosmic system". The spirit of God is the creator of the order. The above applies to the entire Universe.

The "daemon" of Socrates is the voice of God that works inside us, it is an echo of the voice that governs the Universe and defines the operation of everything in the

world. This way, Socrates unites in a mutual substance the man, the Universe and the God! Socrates cogitates the sky, detects the stars, envisions the entire world and within him there is the profound conviction that through the “cosmic creation” and the “human fate”, a superior Intellect, which is an imprint of our own Intellect, dominates.

Democritus and Leukippos supported that the atoms are the last molecules of matter which are not susceptible to incisions (they cannot be divided) or fluctuations, are unborn, indestructible, unchangeable and indivisible, complete and perfect, compact, united and simple, while they are numerically infinite, vastly varied in shape and move continuously in space. Namely, using contemporary terminology, Leukippos and Democritus introduced an energy “conservation principle” of the atom.

Plato believed that every phenomenon of the world is deceptive and everything perceived by the human senses is an illusion. Through Virtue, Plato discovers the immaterial world, which he calls an Idea, and he becomes the founder of Ideocracy. The interpretation of the matter of the visible world is a fraud, for Plato.

The soul has a divine origin, it is related to the Ideas, but it is the only thing in the world that is similar to the Ideas. By knowing, the soul of the divine becomes divine itself and equal to God Himself. Dialectics is the queen of the sciences and the only path to true knowledge.

The eastern and Asian philosophies and religions were led through introspection, meditation, intuition, insight and mystical experience to the understanding of the deep structure of the natural world. We could say that they do not constitute philosophies, with the west notion of the term, since they are not expressed by the rational intellect, the logical argument and the declarative language of science, but by parables, allegories, images and poetic language.

The eastern philosophy points a path to the revelation of truth, namely the living experience that humans, plants, animals, the planet, the stars, everybody and everything is One. Everything is made of the same “universal matter”. The separations are metaphysical abstractions and mental constructions. The difference between the western and the eastern and Asian thought is the way that we will reach the ultimate knowledge, the knowledge of wholeness.

There is no methodology on the western sense, a system of predefined rules that aim on a purpose. There is the path of the personal search. That is why we support that the “knowledge” is not mental, namely impersonal, but it is experiential, i.e., personal. The “knowledge” is ineffable and inexpressible, for it is not expressed in words, but shown with attitude, manner and style.

The eastern and Asian thought is poetical thought and wisdom of life. The western philosophy is a rational thought seeking for the truth by the abstract mind and the natural or artificial symbolism of language and mathematics.

The eastern philosophy denied the division into matter and spirit, on which the western philosophy and science was founded. It is talking about the unbreakable One. Namely, it is neither idealism, nor materialism. It does not accept this theoretical division on knowledge.

The western thought founded its building on the division of matter and spirit and from this division emerged the two philosophical currents of materialism and idealism. The western science today ends up on the same conclusion with the eastern philosophy. We surpass this division between matter and spirit. The nature is united. We go over matter and spirit.

Besides, at the contemporary physics, matter and energy is the same. The Universe is energy. The matter is nothing more than concentrated energy. What is more, the division into spirit that observes and matter that is being observed has been refuted by the double slit experiment of quantum physics. In this experiment the observer and the object being observed are one since they affect one another. The science of Chaos teaches us that everything is interconnected, but the contemporary developments in neuroscience, getting started with the brain neurons and their multiple connections, reveal the topology of the brain, a miniature of the universal geometry of everything.

For example, the Hindu tradition of the Upanishads faces the personal ego as an illusion (Maya). Maya separates the personal Ego from the transcendent Being (Brahman). When the illusion of the personal Ego is spoiled, then the compound with

the Transcendent Being is achieved. The Transcendent Being is located deep inside the human's soul (Atman). The human's soul (Atman) and the Transcendent Being (Brahman) are the Same, boundlessly and timelessly. You are this one (tat tvam asi) "The one who lives inside all beings, but is something else compared to them. He, who is being ignored by the beings, but his body is all the beings. He, who controls all the beings from inside. He is your Soul, the internal Auditor, the Immortal". A Buddhist text gives us a vision of the time: "Buddha taught the past, the future, the natural world and each one of us is nothing but names, forms of thought, public words, simply superficial realities." A Buddhist sutra says: "the form is the vacuum, the vacuum is the form". For the Japanese Buddhist zen there is no other space, there is no other time. This moment is everything. In this moment the whole being is being summarized. In this moment everything is available, into this moment eternity penetrates the existence and existence penetrates eternity.

Bohr's quantum principle of complementarity supports that everything in the Universe consists of opposed sections. The Chinese Tao is the symbol that characterizes the dialectic unity of opposites. The Tao is the rhythm which connects the opposites.

The wisdom of the ancient knowledge and the philosophy of the contemporary scientific knowledge converge and create open thought, the thought of open Wholeness. The core of the open thought is the cosmic consciousness. In every particle, atom, molecule, cell of matter the energy and the information of the cosmic spirit is concentrated. The history of the universal spirit and the spirit of the universal history of spirit unfold through time and in different places. They are history of transformation of our relationship with the world. The knowledge of the cosmic spirit is an unchanged structure, which is expressed in multiple forms in the evolutionary history of the universe.



## The metaphysical and the epistemological question

Leibniz in his work “Principles de la nature et de la grace” formulates the most primordial question of metaphysics: “Why does there exist something but not nothing?” This question is connected to the “principle of sufficient reason” and urges to the search for a cause or a foundation that affirms the existence of beings. This search ends to the highest being: God. Heidegger separates nothing / zero from beings, the Being emerges from this difference between zero and beings. This difference reminds to the man his mortality and because of that it constitutes the cause of the existential angst. In that sense, the question “Why does there exist something but not nothing” cannot be answered, it remains in air and reminds the man that he lives permanently on the brink of the abyss (zero).

Let's move from the metaphysical question to the epistemological question that interests cosmology. Why does there exist the universe and not the chaos? The question seems unanswered. However, the answer may be simple: there exists “something” but not nothing, because “something” is simpler than nothing. If there did not exist anything, then nothing would be something that would be nothing. However, since nothing is not anything, this is the reason why something that is nothing is definitely something undefined, that is nothing.

As a consequence the universe has to be something; the infinite chaos that has been zeroed and the product is 1. Namely:  $\infty \times 0 = 1$  [“time”], which means that we count number one from the moment that the multiplication of the chaos with the zero produces basically the detachment of the infinite from the zero and equals 2 (duplication: chaos - zero). Each time the distance between chaos and zero is duplicated, we add one more “time” and we have 2. Namely, we are talking technically about a logarithmic scale instead of a “Linear” traditional scale.

Finally, the universe is nothing more but a continuous and uninterrupted logarithmic multiplier of the first two factors, chaos and zero. The appearance of the universe marks the onset of light which results from the operative Darkness – the Dark Energy. Light and darkness are nothing more than the two sides of the same coin: the Primary Unit (1), which has no beginning, since it arises as a product of infinity and zero (=chaos).

It has to be reminded that in Cosmogony of Hesiod it is mentioned that the world as formatted matter, was created from Chaos (abyss), from nothing, blank, zero. The world, that is, was created from the undefined, the unformed, that which can transform into anything.

## **Basic scientific assumptions**

The first scientific assumption of the contemporary scientific thought, which is confirmed by the experimental procedure, is that the perceivable material reality is a fallacy of the human physiology, which is created inside specific brain regions with the aid of our sense organs. The material reality is no more than a matrix.

According to the Special Theory of Relativity, the material universal reality is nothing more than a “projection (an image, a mirroring) of whatever exists on the real four dimensional non Euclidean and invisible Universe on a false three dimensional and Euclidean space that is created by our senses.” This space is called, by the Special Theory of Relativity, Minkowski space.

The second scientific assumption is the concept of Wholeness. The Universe of the contemporary science is a single system that cannot be divided into parts. The sense of individual objects and forms is nothing more than a fallacy which is based on a peculiarity, basically, of our vision and our cerebral constitution in general. The Universe is united and indivisible, but it can be expressed in multiple forms.

Inside the united and indivisible universal Wholeness, every thought and action we make concerning the part, creates the reaction of the whole towards us. In short, whatever we are doing and in whichever way we are doing it, has a multiple effect on us, from every “corner” of the universal unity. The meaning of universal, indivisible unity creates a new social and ecological awareness, since the social and the nature are structural parts of the whole and every action we take against it, results in a reaction of the whole cosmic creation against us.