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An introduction to
Syntropy

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Introduction

“In the days just before Christmas 1941, as a consequence of conversations with two colleagues, a physicist and a biologist, I was suddenly projected into a new panorama, which radically changed the vision of science and of the Universe which I had inherited from my teachers, and which I had always considered the strong and certain ground on which to base my scientific investigations. Suddenly I saw the possibility of interpreting a wide range of solutions (the anticipated potentials) of the wave equation which can be considered the fundamental law of the Universe. These solutions had been always rejected as “impossible”, but suddenly they appeared “possible”, and they explained a new category of phenomena which I later named “syntropic”, totally different from the entropic ones, of the mechanical, physical and chemical laws, which obey only the principle of classical causation and the law of entropy. Syntropic phenomena, which are instead represented by those strange solutions of the “anticipated potentials”, should obey the two opposite principles of finality (moved by a final cause placed in the future, and not by a cause which is placed in the past) and differentiation, and also be non-causable in a laboratory. This last characteristic explains why this type of phenomena has never been reproduced in a laboratory, and its finalistic properties justified the refusal among scientists, who accepted without any doubt the assumption that finalism is a “metaphysical” principle, outside Science and Nature. This assumption obstructed the way to a calm investigation of the real existence of this second type of phenomena; an investigation which I accepted to carry out, even though I felt as if I were falling into an abyss, with incredible consequences and conclusions. It suddenly seemed as if the sky were falling apart, or at least the certainties on which mechanical science had based its assumptions. It appeared to me clear that these “syntropic”, finalistic phenomena which lead to differentiation and could not be reproduced in a laboratory, were real, and existed in nature, as I could recognize them in the living systems. The properties of this new law, opened consequences which were just incredible and which could deeply change the biological, medical, psychological, and social sciences.”

Luigi Fantappiè

Rome, 9 November 1955

1. The dual solution of the wave equation

The equation $E = mc^2$, commonly associated with the work of Albert Einstein, was first published in 1890 by Oliver Heaviside and then refined by Henri Poincaré in 1900 and Olinto De Pretto in 1903, and it then became famous with Einstein's special relativity where it was integrated with the momentum in the energy/momentum/mass equation.

$$E^2 = c^2 p^2 + m^2 c^4$$

Where the total energy (E) of an object is the result of the sum of the momentum (p) and the mass (m), multiplied by the speed of light (c).

The energy/momentum/mass equation is a second order equation which requires the use of a square root in order to obtain the value of E . Square roots always yield two solutions, one positive and one negative. As a consequence of this fact the outcome of the energy/momentum/mass equation is always dual: one positive ($+E$) and one negative ($-E$).

It is important to note that according to special relativity:

- The positive solution ($+E$) describes energy which propagates in the familiar direction, from the past to the future;
- The negative solution ($-E$) describes energy which propagates backwards in time, from the future to the past.

When objects share the same inertial system, $p=0$ and the energy/momentum/mass equation simplifies into $E = mc^2$ (Einstein's famous equation), with no negative solution which moves backwards in time.

However, in 1924 Wolfgang Pauli (Nobel Prize 1945 for physics), studying the spin associated with electrons, discovered a momentum (p) which could never be equal to zero, and which is a basic element of matter. Even an object which is perfectly still has a momentum which derives from the spin of electrons. As a consequence of this discovery the energy/momentum/mass equation could not be simplified, at least in the sub-atomic world.

In 1926 Klein and Gordon united the energy/momentum/mass relation (special relativity) with Schrödinger's wave equation (quantum mechanics) obtaining the following equation:

$$E\psi = \sqrt{p^2 + m^2}\psi$$

The solution of Klein and Gordon's equation depends on a square root which always leads to a positive solution ($+E\psi$), in which waves propagate from the past to the future (retarded waves), and a negative solution ($-E\psi$), according to which waves propagate backwards in time, from the future to the past (advanced waves).

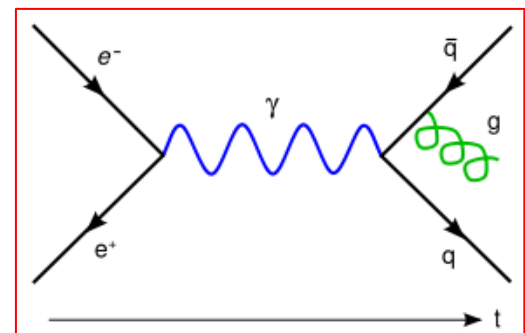
In 1928 Paul Dirac tried to remove the unwanted negative solution, which propagates backwards in time, by applying the energy/momentum/mass equation to the study of relativistic electrons. With great disappointment he was faced again with the dual solution: electrons (e^-) and neg-electrons (e^+ , the anti-particle of the electron). The anti-particle of the electron, which was first named neg-electron by Dirac, was experimentally observed by Carl Anderson in 1932 and named *positron*. Anderson became the first person who proved empirically the existence of the negative energy solution: the negative solution was no longer an impossible mathematical absurdity, but an empirical evidence. Dirac's equation predicts a universe made of matter which moves forwards in time and antimatter which moves backwards in time.

Roger Penrose in his book "The Road to Reality" (Penrose, 2005) underlines that usually physicists tend to reject as "unphysical" any solution which contradicts classical causality, according to which causes always precede effects. Any solution which makes it possible to send a signal backwards in time is usually rejected. Even if Penrose chose to reject the negative solution of the energy equation, he states that this refusal is a consequence of a subjective choice, towards which other physicists have different opinions. Penrose dedicates nearly 200 pages of his book to the paradox of the negative solution. According to Penrose it is important that the value of E is always positive because negative values of E lead to catastrophic instabilities in the Standard Model of sub-atomic physics. *"Unfortunately in relativistic particles both solutions of the equation need to be considered as a possibility, even a non physical negative energy has to be considered as a possibility. This does not happen in non relativistic particles. In this last case, the quantity is always defined as positive, and the embarrassing negative solution does not appear."* Penrose adds that the relativistic version of Schrödinger's equation does not offer a procedure in order to exclude the negative solution. In

the case of a single particle this does not lead to any real problem, however when particles interact, the wave function cannot yield only the positive solution. This creates a conflict with the law of classical causation. In order to remove the embarrassing negative solution, in 1931 Dirac suggested an hypothesis which Penrose describes simply as crazy. Dirac used Pauli's principle, according to which two electrons cannot share the same state, to suggest that all states of negative energy are occupied, thereby forbidding any interaction between positive and negative states of matter. This ocean of negative energy which occupies all positive states is called *Dirac sea*. The Standard Model of physics is based on this assumption.

Even if classical physics rejects the negative solution of energy and the possibility of retrocausality, several respected scientists have worked and are working on this possibility.

A classical example is Feynman's diagrams of electron-positron annihilation, according to which electrons are not destroyed by the contact with positrons, but the release of energy is caused by electrons changing direction in time and becoming positrons. When Feynman's diagrams are interpreted they imply necessarily the existence of retrocausality (Feynman,



1949). Feynman has also used the concept of retrocausality to produce a model of positrons which reinterprets Dirac's hypothesis on the sea of negative energy occupying all possible states. In this model, electrons which move backwards in time would acquire positive charges (Wheeler 1945).

Yoichiro Nambu has applied Feynman's model to the processes of annihilation of particle-antiparticle couples, arriving at the conclusion that it is not a process of annihilation or creation of couples of particles and antiparticles, but simply a change of the time direction of particles, from the past to the future or from the future to the past (Nambu 1950).

Costa de Beauregard used the concept of retrocausality in order to explain entanglement (de Beauregard, 1977) and in 1986 John Cramer, physicist at the Washington State University, formulated his transaction interpretation, inspired by the absorber-emitter model developed by Wheeler and Feynman. Cramer notes that the generalization of Schrödinger's wave equation into a relativistic invariant equation (Klein-Gordon 1926) has two solutions, one positive, which describes waves which propagate forwards in time, and one negative, which describes waves which propagate

backwards in time. This dual solution would explain the dual nature of matter (particles and waves), non locality and all the other mysteries of quantum mechanics leaving the formalism of quantum mechanics the same.

Until the XIX century, time was considered to be irreversible, a sequence of absolute moments. In 1954 the philosopher Michael Dummet showed that there is no philosophical contradiction in the idea that effects can precede causes (Dummet, 1954). More recently, Jan Faye of the University of Copenhagen argued that even if it will not be possible to organize time travel at the macroscopic level, this fact does not exclude that retrocausality can act at other levels (Faye, 1994), and Jeanne Peijnenburg uses the concept of retrocausality in order to describe and redefine the cognitive processes of perception (Peijnenburg, 1999).

Einstein's relativity started a new description of reality which is symmetrical in respect of time: on one side energy which propagates from the past to the future, on the other side energy which propagates backwards in time from the future to the past, and which we experiment as *attractors*. Einstein used the term *Übercausalität* (supercausality) to refer to this new model of causality.

2. The law of Syntropy

In July 1942 the mathematician Luigi Fantappiè presented at the Pontifical Accademy of Science the "*Principles of a Unitary Theory of the Physical and Biological World based on Quantum Mechanics and Special Relativity*" in which he showed that retarded waves which diverge from causes located in the past, are governed by the law of *entropy* (*en*=apart, *tropos*=tendency) and correspond to mechanical and chemical phenomena; while advanced waves, which converge towards causes located in the future are governed by a law symmetrical to entropy, which Fantappiè named *syntropy* (*syn*=together, *tropos*=tendency). Analyzing the mathematical properties of advanced waves Fantappiè noted that they coincide with the qualities of life: differentiation, order and organization.

The second principle of thermodynamics states that in each transformation of energy (for example when heat is transformed into work), a part of energy is dispersed in the environment. Entropy measures how much energy has been dissipated in the environment. When energy is distributed in a uniform way (for example no variations in heat exist), a state of equilibrium is reached and it is impossible to transform energy into work. Entropy, therefore, measures how

much a system is near to the state of equilibrium: the state of disorder in the system.

Entropic phenomena show the following characteristics (Fantappiè, 1942):

- 1) *causality*: diverging waves cannot exist in the absence of causes which have generated them;
- 2) *tendency towards homogeneity*: entropic phenomena tend to level out in the sense that they evolve from differentiation to homogeneity, from complex to simple. With time homogeneity and uniformity of the system grow: the entropy of the system grows.

Analyzing the mathematical properties of syntropy Fantappiè noted that:

1. Syntropy diminishes entropy. Entropic phenomena are governed by the second law of thermodynamics according to which a system tends towards homogeneity and disorder. Fantappiè's formulation of syntropy differs from Schrödinger's negentropy ($-E$), as entropy and syntropy are treated as complements: $Syntropy = I - Entropy$
2. Syntropic phenomena concentrate matter and energy in a smaller space (ie this principle is well described by the large quantities of energy accumulated by living systems of the past and now available in the form of coal, petrol and gases).
3. Because syntropy leads to the concentration of matter and energy, and this concentration cannot be indefinite, entropic processes are needed to compensate syntropic concentration. These processes take the form of the exchange of matter and energy with the environment. Metabolism is an example: *anabolism* (syntropy) which includes all the processes which transform simple structures into complex structures, nutritive elements into bio-molecules, with the absorption of energy; *catabolism* (entropy) which includes all the processes which transform higher level structures into lower level structures, with the release of energy.
4. Syntropy coincides with final causes, attractors, and it is therefore possible to introduce scientific finalism, where finalism means final causes.

Fantappiè discovered that the following properties are associated with the law of syntropy: concentration of energy, differentiation, creation of structures and order. He noted that these properties can be found in living systems and arrived in this way at the conclusion that living systems are, in their essence, attracted by the future, and therefore anticipatory systems.

3. Syntropy and Life

The law of syntropy describes life as an interaction between the law of entropy, which dominates the macro level of reality, and the law of syntropy, which dominates the micro level, the sub-atomic level.

It is important to note that:

- in 1927 Sir Arthur Eddington coined the expression “*the arrow of time*”, showing that entropy forces events to move from past to future. In 1982 Frautschi discovered that in an expanding Universe entropy prevails and time is forced to flow from the past to the future.
- On the contrary, in a converging universe, time would flow backwards, from the future to the past, as a consequence of the fact that converging waves prevail on diverging waves. An example are black holes, in which time would flow backwards.
- In a system which is balanced between diverging and converging forces (for example the atomic level) time should be unitary: past, present and future would coexist.

According to the theory of syntropy the following model of life takes form:

- Starting from the consideration that at the macrocosm level the law of entropy prevails, it is considered impossible that life can be a product of the laws which govern the macrocosm. On the contrary, at the microcosm level (Quantum Mechanics) time is unitary and syntropy can prevail on entropy, life could therefore be a consequence of the syntropic law which can prevail in the microcosm.
- According to the fact that the law of syntropy leads to the development of structures and forms of organization which rapidly grow from the microcosm to the macrocosm level, and according to the fact that at the macrocosm level the law of entropy prevails, which tends to destroy any form of organization and structure, the hypothesis is that a conflict between life structures and the law of entropy originates when these structures grow beyond the microcosm level. In order to contrast the destructive effects of entropy, life structures would need to feed on syntropy, which is available at the microcosm level.
- Structures which operate as a bridge between the microcosm (Quantum Mechanics) and the macrocosm are therefore expected. These structures have been observed by several authors,

among whom Eccles (1989), Penrose (1994), Bondi (2005) and Hameroff (2007). The hypothesis is that these structures are needed in order to feed living systems with syntropy.

- The hypothesis is that structures which support vital functions feed on syntropy. In human beings the Autonomic Nervous System (ANS) supports vital functions and the hypothesis is therefore that the physiological parameters associated with ANS, for example heart rate (HR) and skin conductance, should show anticipated reactions to stimuli as they feed on syntropy (anticipated waves).

The law of syntropy describes life as systems responding to classical causes, located in the past, and retrocausality, causes located in the future. It is well known to biologists that classical causes are dominated by the law of entropy and cannot explain regenerative processes and especially the tendency of life to evolve from homogeneity to complexity and differentiation. This fact characterizes the strong contraposition between those who support Darwin's model of evolution and those who support other types of models of evolution. Those who support Darwin's model of evolution try to explain the properties and the evolution of living systems as a consequence of chance, random mutations and "trials and errors". However simple statistical calculations falsify this hypothesis. For example, "*the probability that the simplest protein molecule (2,000 atoms) takes form by chance is, according to classical thermodynamics, which governs entropic phenomena, inferior to 10^{-600}* " (Fantappiè, 1942). This probability value would not allow the simplest protein to appear, as a consequence of chance, in all the history of the Universe, and if it would appear accidentally it would be destroyed immediately by the law of entropy, which dominates the macrocosm level.

4. Supercausality, choice and attractors

The mathematician Chris King (1996), in his attempt to explain consciousness, starts from the dual solution of the Klein-Gordon's equation. According to King each cell and each biological process is constantly faced with bifurcations between information arriving from the past (diverging waves, emitters, entropy) and information arriving from the future (converging waves, absorbers, syntropy). As a consequence of these bifurcations living systems are forced to operate choices. The outcome of these constant processes of choice cannot be determined in advance and King therefore suggests that at all its levels living systems would show chaotic processes.

It is interesting to note the contradiction in the way the words “order” and “disorder” are used. In thermodynamics disorder is a property of mechanical deterministic systems, governed by entropy with causes in the past, while according to the negative solution of the wave equation order is a property of syntropy and attractors, in which causes are placed in the future. In the science of chaos, on the contrary, order is associated with deterministic systems (entropic systems), while disorder is associated with attractors (syntropic systems). The origin of this contradiction can be found in the fact that in the science of chaos, “ordered” systems are those which can be predicted (a property which is true only within entropic systems), while “disordered” systems are those which cannot be predicted (a property which is true within syntropic systems).

It is fascinating to note that, contrary to what we would intuitively expect, the existence of causes located in the future implies a future which is not determined, while causes located in the past imply a determined future. As a consequence of the existence of causes located in the future living systems are forced to operate choices; the outcome of choices is undetermined and the future becomes undetermined.

In 1963 the meteorologist Lorenz discovered the existence of chaotic systems which react, in each point of their states, to small variations. Studying, for example, a simple mathematical model of meteorological phenomena, Lorenz found that a small perturbation could generate a chaotic state which would amplify, making weather forecasting impossible (Lorenz, 1963). Analyzing these unforeseeable events, Lorenz found the existence of an attractor which he named the “chaotic attractor of Lorenz”: this attractor causes microscopic perturbations to be amplified, and interfere with the macroscopic behavior of the system. Lorenz described this situation with the words: “*The flap of a butterfly’s wings in Brazil can set off a tornado in Texas*”.

Inserting an attractor (syntropy) in chaotic systems, complex and ordered figures, known as fractals, are generated. Fractal geometry, was discovered in the 1970’s by the mathematician Mandelbrot studying functions which tend to a limit which will never be reached (Mandelbrot, 1987). For example, if we repeat the square-root of any positive number except one, the result will tend to one, but never reach it. The number one is therefore the attractor of the square-root of positive numbers. In the same way, if we square a number superior to one the result will tend to infinity, and if we square a number inferior to one the result will tend to zero. Fractal figures are a result of the interaction of attractors introduced into geometrical figures; fractals show, in a visual way, what happens when syntropy and entropy interact together.

Fractal geometry reproduces some of the most important structures of living systems, and many researchers are arriving at the conclusion that life processes follow fractal geometry: the outline of a leaf, the growth of corals, the form of the brain and the nervous terminations. An incredible number of fractal structures has been discovered, for example:

1. Blood arteries and coronary veins show ramifications which are fractals. Veins divide into smaller veins which divide into smaller ones. It seems that these fractal structures have an important role in the contractions and conduction of electrical stimuli: the spectral analysis of the heart frequency shows that the normal frequency resembles a chaotic structure.
2. Neurons show fractal structures: if neurons are examined at low magnifications, ramifications can be observed from which other ramifications depart, and so on.
3. Lungs follow fractal designs which can easily be replicated with a computer. They form a tree with multiple ramifications, and with configurations which are similar at both low and high magnifications.

These observations have led to the hypothesis that the organization and evolution of living systems (tissues, nervous system, etc.) can be guided by attractors (causes placed in the future) in a similar way to that which happens in fractal geometry.

5. Empirical evidence

Fantappiè noted that because anticipated waves do not obey classical causation, they cannot be studied with experiments which obey the classical experimental method (Fantappiè, 1944). Similar conclusions have been reached by Wheeler, Feynman and Cramer:

- According to Wheeler and Feynman's electrodynamics, emitters coincide with retarded fields, which propagate into the future, while absorbers coincide with advanced fields, which propagate backwards in time. This time-symmetric model leads to predictions identical with those of conventional electrodynamics. For this reason, it is impossible to distinguish between time-symmetric results and conventional results (Wheeler and Feynman, 1949).

- In his *Transactional Interpretations of Quantum Mechanics*, Cramer states “*Nature, in a very subtle way, may be engaging in backwards-in-time handshaking. However, the use of this mechanism is not available to experimental investigators even at the microscopic level. The completed transaction erases all advanced effects, so that no advanced wave signaling is possible. The future can affect the past only very indirectly, by offering possibilities for transactions*” (Cramer, 1986).

According to Fantappiè, living systems are a direct consequence of anticipated waves which move backwards in time (law of syntropy), and consequently it should be possible to study anticipatory pre-stimuli reactions, using living systems.

In the last decade a growing number of studies have shown the existence of pre-stimuli reactions in the parameters of skin conductance and heart rate. Anticipatory pre-stimuli reactions are neurophysiologic responses activated before the stimulus takes place. These anticipatory reactions are activated before the subject can receive indications or cues about the stimulus. In scientific literature, various experiments show the existence of anticipatory effects, for example:

1. *Anticipatory reaction of skin conductance.* In 2003 Spottiswoode and May of the Cognitive Science Laboratory replicated Bierman and Radin (1997) experiments which show an increase in skin conductance 2-3 seconds before emotional stimuli are presented. Spottiswoode and May replicated these results obtaining a statistical significance of $p=0.0005$, and performed controls in order to exclude all possible artifacts and alternative explanations. These results support the hypothesis that the autonomic nervous system reacts in advance of stimuli (Spottiswoode and May, 2003).
2. *Electrophysiological responses.* McCarty, Atkinson and Bradely in “*Electrophysiological Evidence of Intuition*” (2004) show the existence of strong anticipatory reactions of the electrophysiological parameters of the heart.
3. *Pre-stimuli heart rate differences.* In his article “*Heart Rate Differences between Targets and Non Targets in Intuitive Tasks*”, Tressoldi and coll. report results of two experiments aimed at investigating pre-stimuli heart rate changes. Results support the hypothesis that heart rate changes before stimuli are applied (Tressoldi 2005).

are correlated with decision making deficits. These patients respond in a normal way to the majority of tests and their cognitive functions are undamaged: intelligence, perception, memory, learning, language, arithmetic, attention and mental plasticity. They show normal intellect, but are unable to decide for their future. In his clinical observations, Damasio constantly noted the importance of the future: *subjects with decision-making deficits show behavior which could be defined as short-sighted towards the future* (Damasio, 1994). Damasio underlines that this same deficit affects those who are under the effect of alcohol or drugs. In these patients Damasio observed no worry about the future, the inability to plan the future, the inability to produce efficient plans for the coming hours, confusion about priorities, the absence of intuition and the absence of any trace of precognition.

According to Damasio, the use of reasoning depends, to a large extent, on the ability to feel emotions. Damasio suggests that during evolution the strategies of reasoning developed, guided by biological mechanisms of regulation, of which emotions and feelings are important aspects. This hypothesis would be supported by the fact that when in danger, when choices need to be made quickly, reasoning is bypassed. Damasio uses the example of fear, an emotion in which the role of reasoning is limited, which allows people to make instantaneous decisions in order to avoid risks, and underlines the extraordinary fact that emotions and feelings are essential in order to perform advantageous decisions.

The study of neurological patients affected by decision making deficits shows that the processes which are usually judged necessary and sufficient are intact. Tests show that the following functions are performing correctly: short and long term memory, operational memory, attention, perception, language, abstract logic, arithmetical abilities, intelligence, learning, the knowledge of elements which constitute the problem on which it is necessary to operate a decision and the system of values. These subjects respond in a normal way to the majority of tests and their cognitive functions are undamaged. They show normal intellect, but are unable to decide in an appropriate way for their future. A dissociation between the ability to decide advantageously and the ability to decide for objects, numbers and space is observed. In neuropsychology this deficit is described as dissociation between cognitive abilities and their use. On one side the cognitive abilities are undamaged, on the other side the patient is not able to use them advantageously for the future. This dissociation also takes the form of reduced links between the abstract system of values and real life.

Studying neurological patients Damasio discovered that deficits in decision making were always accompanied by alterations in emotions and in the ability to feel emotional states. According to

Damasio, the use of reasoning strategies depends, to a large extent, on the ability to feel emotions. These patients are always neutral in respect to emotions, never showing any emotion, sadness, impatience or frustration. The absence of emotional reactions, positive or negative, is observed. Damasio says that these subjects are characterized by *knowing* but not by *feeling*.

7. The feeling of life

Wheeler, Feynman (1949) and Fantappiè (1942) showed that advanced waves behave as absorbers whereas retarded waves behave as emitters. In 1941 Fantappiè discovered that, according to the law of syntropy, living systems are a consequence of advanced waves and would behave as energy absorbers. He then arrived at the conclusion that the energy balance of living systems would, therefore, always be positive, in favor of absorption. The assertion that living systems absorb energy is consistent with the realization that nearly all the energy used by humanity derives from biological masses: wood, coal, petrol, gas, and bio-fuels.

The distinction between absorbers and emitters provides an interesting insight into one other basic property of life: the “feeling of life”. According to Damasio the “background feeling” which is the equivalent of the “feeling of life” is the fundamental element of consciousness and life. Likewise, Fantappiè asserts that “advanced waves are the essence of life itself”. If both Damasio and Fantappiè are right, it would follow that the feeling of life, consciousness, is a direct consequence of advanced waves, since life itself is, according to the law of syntropy, a consequence of advanced waves. A more intuitive understanding of the link between advanced waves and consciousness may come when considering the “feeling of life” as a consequence of converging waves/absorbers, rather than a consequence of diverging waves/emitters (retarded waves). The equivalence “*feeling of life = advanced waves*” leads to the conclusion that systems based on the positive solution (entropy), as for example machines and computers, would never show the “feeling of life” independently from their complexity, while systems based on the negative energy solution (syntropy), as for example life itself, would always have a “feeling of life”, independently from their complexity.

According to these considerations, Fantappiè’s model would be compatible with the model suggested by Damasio, and it could even represent an extension and specification of this model. The background feeling described by Damasio would coincide with the feeling of life described by

Fantappiè and would take the form of emotions and feelings, localized in the ANS area. The only major difference with Damasio's model is that Fantappiè's hypothesis suggests that emotions and feelings would be, at least in part, the consequence of future states.

8. The fight against entropy and the vital needs model

As a consequence of the fact that the macrocosm level of reality is governed by the law of entropy, several biologists (Monod, 1974) reached the conclusion that the properties of life cannot originate exclusively from the laws which govern the macrocosm, as entropy results in the leveling and destruction of any form of order and organization, contradicting in this way the possibility of life.

The conflict between life and entropy is well known and discussed by biologists and physicists. Schrödinger (Nobel prize 1933), answering the question about what allows life to contrast entropy, concluded that life feeds on "negative entropy" (Schrödinger, 1988). Albert Szent-Györgyi (Nobel prize winner in 1937 in the field of physiology and discoverer of the vitamin C) arrived at a similar conclusion when he suggested to use the term syntropy in order to describe the fundamental qualities of living systems (Szent-Györgyi, 1977): *"One major difference between amoebas and humans is the increase in complexity, which presupposes the existence of a mechanism which is capable of contrasting the second law of thermodynamics. In other words a force must exist which is capable of contrasting the universal tendency of matter towards chaos, and of energy towards heat death. Life continuously shows a decrease in entropy and an increase in inner complexity, and often also in the complexity of the environment, in direct opposition with the law of entropy."* In the 1970s Szent-Gyorgyi concluded that in living systems there was wide evidence of the existence of the law of syntropy, even though he never managed to infer it from the laws of physics. While entropy is a universal law which leads towards the disintegration of all types of organization, syntropy is the opposite law which attracts living systems towards forms of organization which are always more complex and harmonic (Szent-Gyorgyi, 1977). The main problem, according to Szent-Gyorgyi, is that *"a profound difference between organic and inorganic systems can be observed ... as a man of science I cannot believe that the laws of physics lose their validity at the surface of our skin. The law of entropy does not govern living systems."*

The law of syntropy explains how life counterbalances the destructive and mortal effects of entropy and a model of "vital needs" is the outcome of this explanation. This model describes three

fundamental categories of requirements, which have to be satisfied in order to survive the mortal effects of entropy:

- to combat the dissipative effects of entropy: *material needs*;
- to acquire syntropy from the microcosm: *the need for love*;
- to solve the conflict between entropy and syntropy: *the need for meaning*.

Combat the dissipative effects of entropy: material needs

In order to combat the dissipative effects of entropy, living systems need to acquire energy from outside and protect themselves from the dissipative effects of entropy. These conditions are referred to as material needs, and include the need to acquire energy from outside, for example with food; and the need to reduce the dissipation of energy, for example with a shelter (housing) and clothes.

In order to combat the continuous production of waste, which is the consequence of the destruction of structures under the effect of entropy, hygienic and sanitary standards and waste disposal are needed.

When these needs are partially unsatisfied, pain is experienced in the forms of hunger, thirst, and sickness, and when they are totally unsatisfied the consequence is death. The total satisfaction of material needs leads to a state of well being, which is characterized by the absence of pain linked to material needs.

Acquire syntropy from the microcosm: the need for love

Satisfying material needs does not stop entropy from destroying the structures of the living systems: cells die, and structures are destroyed; the living systems are therefore continuously required to repair the damages caused by entropy. In order to mend these damages syntropy is needed, as it is the only property which allows to create order and organization and to counterbalance the destructive effects of entropy.

Fantappiè suggests the existence of structures which would support the vital process of organisms feeding on syntropy, such as the autonomic nervous system (ANS) in human beings. ANS would acquire syntropy from the microcosm, feeding in this way the regenerative and vital processes of living systems.

Because syntropy converges energy:

- When syntropy is acquired feelings of heat (concentration of energy), associated with feelings of well-being, would be experienced in the thorax area (typical of the ANS). These feelings of heat and well-being in the thorax area are generally called happiness and love.
- When syntropy is not acquired feelings of cold and emptiness would be experienced in the thorax area, associated with feelings of pain and suffering. These feelings are generally called anxiety and panic, and are accompanied with nausea and vertigo.

According to the vital needs model, the need to feed on syntropy is experienced as the need for love. When this need is not satisfied feelings of emptiness, chill and pain accompanied with anxiety, fear and panic are experienced. When this need is totally non satisfied ANS would not be capable to support vital functions and to feed regenerative processes, and damages produced by entropy would not be repaired, leading the system to death.

Solve the conflict between entropy and syntropy: the need for meaning

In order to satisfy the material needs, living systems have developed cortical systems which reached their highest complexity in human beings. These cortical systems produce representations of the environment which permit the comparison of the living system with the environment. This process initiates the conflict between entropy and syntropy: while entropy has inflated the universe towards infinite (diverging waves), syntropy (converging waves) forces living systems to be finite and localized. Comparing the finite of the living system (syntropy) with the infinite of the environment (entropy) the result tends to zero:

$$\frac{1}{\infty} \rightarrow 0$$

1 symbolizes the living system which is finite (syntropy)
 infinite symbolizes the environment (entropy)

In other words, comparing ourselves with the environment which is infinite we become aware of the fact that we are equal to nothing. But to be equal to nothing is equivalent to death, a fact which is incompatible with the feeling of life. It is therefore necessary to solve this conflict between being (1) and not being (0), a conflict which consumes energy and increases entropy. This conflict is generally felt as the need to give a meaning to life, for example:

- increasing our own value (through richness, power, achievement, etc.);
- finding a purpose in life, a finality (through ideologies, religion, etc.).

Being equal to zero means to be dead, and this fact is incompatible with the feeling of life. It becomes therefore necessary to solve the identity conflict between being and not being. This need, in humans becomes vital, because if it is not solved, it leads to the dissipation of energy and in the most severe cases to death. The existential crisis connected to this conflict is experienced in the form of lack of meaning, inner conflicts, lack of energy and vitality, generally named depression.

9. The crisis of individuals

According to the vital needs model, people are constantly faced with three vital needs: material needs and needs for love and meaning. When material needs are not satisfied physical suffering is experienced which in the most severe cases can degenerate into death. When the need for love is not satisfied loneliness, emptiness, anxiety and pain in the thorax is experienced; when these forms of suffering degenerate they can lead to death. When the need for meaning is not satisfied, feelings of uselessness, meaningless and being equal to zero are experienced and these feelings can degenerate into depression and in the most severe cases into death.

Because these needs are vital, people are constantly required to respond to them. Therefore, beside answering material needs, people are constantly forced to search for a meaning and for love.

According to the vital needs model, contemporary crisis is the consequence of the inability to fully answer the vital needs. This inability is the consequence of many different factors, among which:

- only material needs are visible, and therefore easy to account for.
- cause-effect reasoning leads to a mechanistic approach to life according to which social and economical sciences, public administration, health and psychology take into account only material needs. Cause-effect logic is also governed by the law of entropy and leads, inevitably, to an increase of entropy.

Some answers which are commonly given to the need for meaning

Material needs can be easily recognized, whereas the need for meaning is immaterial, invisible, and more difficult to be recognized. People are generally not aware of the need for meaning, but they use a great part of their time, energy and money, in order to answer it. They become obsessed with the way they are judged, their popularity; they strive for power and success; they become addicted to ideologies, groups and religions. But, this behavior does not answer the need for meaning. Therefore depression spreads and grows in intensity and people continue spending more time, energy and money in ways which do not answer this vital need.

Being judged by others

Being judged positively is usually the first technique we use in order to give a value to our life. As soon as we start interacting with others we discover that when we are judged positively depression and frustration diminish. Consequently, we feel the need to be judged positively and we do not stand being criticized or judged negatively. Because positive judgments answer the vital need for a meaning they become vital and they are transformed into needs. But, in order to be judged positively, we have to meet the expectations of others; expectations which in time grow and become more challenging. We start playing parts, we use masks which we know are appreciated. The distance between our inner reality and our outward behavior increases; other people see the masks we use, but they are not able to establish a contact with us, we feel isolated and lonely, distant, always more alien in this world. This isolation increases the identity conflict and, as a consequence,

also our need for meaning and of being judged positively.

We enter a loop:

- the more we seek positive judgments, the more we use masks;
- the more we use masks, the more we feel isolated;
- the more we feel isolated, the more we feel meaningless;
- the more we feel meaningless, the more we need to be judged positively.

This loop increases the fear of being judged negatively.

In order to receive positive judgments it is necessary to be part of a group; without a group, without other people, it would not be possible to receive any positive judgment. Others are the source of judgments, of our value, of our meaning, and this generates a deep fear of being refused, a fear which leads to accept any condition the group requires.

Expanding our ego

Through the positive judgment of others we try to solve the identity conflict acquiring value and meaning from the outside world. Another strategy which is commonly used is that of expanding our ego, increasing in this way the value at the numerator of the identity conflict equation.

$$\frac{1 + 1 +}{\infty} \rightarrow 0$$

Typical examples are: money, popularity, power. We can expand our ego in many different ways, but the strategy is always the same: “I mean more because I am worth more”. This strategy does not solve the identity conflict; whichever value we have at the numerator when compared to the infinite of the universe produces a result equal to zero. One could be emperor of the planet, but feel worthless and depressed. One could reach the highest forms of power, where life or death can be decided, but feel equal to nothing.

It is interesting to note that whenever we find a source of value we fall into a loop: if we seek our meaning through money we will always want more money, if we seek it through power we will always want more power.

Extending our ego leads to a permanent state of fear. We become afraid of losing our money, our popularity, our power.

Many psychologists and sociologists have suggested a specific need for power and domination. The vital needs model suggests that power and domination are secondary needs which originate from the unsatisfied need for meaning.

Searching for a purpose

Another strategy is to acquire values from the outside world in order to give a meaning to life.

Ideologies, representations of the world, cultural identities and religions often offer values which provide a meaning for life. As soon as they provide a value they become necessary, vital. But, when these values are observed from the outside, for example when we examine representations which are different from our own, we often ask: “how on earth can someone believe things like these!”

Providing values, ideologies, cultural identities and religions reduce depression, but do not solve the identity conflict between being and not being. The mechanism of the loop is therefore observed also in this case:

- we receive values from the outside world;
- we isolate ourselves from whoever has representations and values different from ours;
- we meet only with people who share the same values and representation of the world;
- the isolation increases the identity conflict and our need for values from the outside world.

History provides an incredible number of examples of how the same message, for example the same message of love which is shared by most religions, when transformed into a value, becomes the reason for intolerance, division, hatred and conflict.

Some answers which are commonly given to the need for love

If you ask: "*Do you know what love is?*", "*Where do you feel love?*" usually people do not answer or, after some time, they usually say: "*Well, I feel love in my head!*". This answer does not sound right! Have you ever seen someone take his hands to his head while exclaiming: "*I love you?*". When we declare our love we naturally take our hands to the breast, to the heart. No one points to the head when declaring love. Whenever we express a feeling, which is truly important for us, we spontaneously take our hands to the heart.

But, nowadays, love is rare: it dissolves immediately, it disappears, it is abstract, we are not able to recognize it; whereas emptiness, anxiety and fear, are strong, real, and painful and people's attention and energies are therefore all oriented on ways to avoid or reduce these inner sufferings. In order to escape emptiness and anxiety we try to suffocate our inner voice, for example:

- *using **substances*** which produce sensations of inner heat (similar to love) such as alcohol and drugs. When we use a substance to answer the need for love, we are replacing the need with the substance and, therefore, we start experiencing the need for the substance. Any substance which produces feelings of warmth, similar to love, can lead to addiction. A typical example is heroin which causes inner feelings which are described to be identical to love: this might be the reason why this substance leads to one of the strongest forms of craving. Also alcohol produces feelings of heat, similar to love, even if addiction starts when it is used to cover emptiness, anxiety and fear. Few people know that when addiction develops, the craving for alcohol degenerates in physical damage and in death when the substance is not available.
- *we get involved in **activities*** which fill every empty moment. When inner suffering becomes unbearable we want to escape any moment of silence in which we might feel our inner state: we become addicted to TV, football, soccer, wars and violence; we start working in a compulsory way, not leaving any free moment to ourselves.

Even love relationships can become ways through which we escape inner suffering. Couples often base their relationship on the need to escape loneliness and silence. Fear of silence and loneliness can be so strong that others become tools, used to escape inner suffering. We do not feel love, but we act as lovers, without realizing that love is not a behavior but a state. People start feeling the emptiness of their relationships, and their fear of being abandoned grows.

10. The crisis of society

According to the vital needs model the demand for goods and services, which fuels economy, can be traced back to the three vital needs. Any economical exchange, according to this model, would receive its value from one or more vital needs. For example the production of food, houses, transportation and energy answers the material need and the existence of the material need gives value to these activities.

World economy is now based on the assumptions that:

- The consumption of material goods causes satisfaction.
- Humanity will always be unsatisfied and therefore people will always ask for more material goods.
- In a healthy economy GDP (Gross Domestic Product) and consumption increase.
- Economical crises coincide with the contraction of consumption.

However, the idea that people will always be unsatisfied and will always want to consume more is incompatible with:

- The physical limits of the planet which do not allow an indefinite increase of the production of material goods. For example humanity is now using each year the amount of fossil fuels (petrol, gas and coal) which required 400 years of biological life to accumulate. Following this pace of consumption in a few decades humanity will have depleted all the energy which the biological life on Earth has accumulated in thousands of years.
- The environmental limits of the planet which do not allow to absorb and convert all the entropy produced by humanity. Entropy takes the form of the greenhouse gas effect, pollution, deforestation, destruction of the biological conditions which support life and humanity. The most visible effect of entropy is the increase of the global temperature of the planet and climatic changes.
- The limits of politics and nations. The use of great quantities of fossil fuels leads to: tensions among countries which consume and produce fossil fuels; concentration of power in the hands

of those groups which control the extraction and distribution of fossil fuels; social and economical instability in the countries rich in fossil fuels.

It is important to note that classical economical models do not take into account the need for love and the need for meaning, as it is believed that the satisfaction of these needs depends on systems such as the family and religious institutions.

But, nowadays:

- Families are faced with growing difficulties in answering the need for love: both parents work, an increase of divorces is observed and more families have only one child.
- Materialistic values are spreading in churches and religious groups find it always more difficult to answer the need for meaning.

The growing inability of families and religions to answer the need for love and the need for meaning is leading to an increase in depression and anxiety, drugs and alcohol abuse, low productivity, health and social costs, conflicts and economical costs.

The need to satisfy the vital needs for love and meaning fuels informal economies based on the exchange of illegal services and goods (drugs, prostitution) and gives power to illegal groups (mafia and criminal organizations) which are financed by the informal economies.

11. Proposal

The vital needs model suggests that in order to reach a society of global wellbeing, economy and science have to take into account all the vital needs. The importance of widening economy and science to the law of syntropy can be resumed in the fact that it leads to the formulation of a proposal, a path which should allow individuals and societies to emerge from the present crisis.

The elements at the basis of this proposal are simple: the centrality of love, the choice of low entropy options, the choice of high syntropy options and choices which take into account all the vital needs.

The centrality of love

Strategies such as being judged by others, expanding our ego or receiving values from the outside world do not solve the identity conflict between being and not being. The formula of the identity conflict shows that the conflict between being and not being can be solved only when we unite ourselves with the universe:

$$\frac{1 \times \infty}{\infty} = 1$$

This equation is called the “Theorem of Love”.

The operator “x” coincides with union, which is the property of syntropy, and converging waves. Because converging waves are perceived in the autonomic nervous system, in the thorax area, in the form of heat and feelings of love, it is possible to say that only when we unite ourselves, through love, with the universe we experience our identity, our meaning.

The identity conflict equation and the theorem of love indicate that:

- when the need for meaning is addressed by increasing the value of the numerator (power, richness, achievement), the identity conflict remains unsolved — because whatever value we have at the numerator compared to infinite, the result is zero.
- Perfect correlation between anxiety and depression must be observed, because when the unity (×) is weak, anxiety increases together with the identity conflict and depression.
- Only through love can we solve the identity conflict between being and not being, and experience the meaning of life. Uniting ourselves with the universe is a property of syntropy and converging waves.

Fantappiè stated that nowadays we see written in the book of nature - which Galileo said was in mathematical characters - the same laws of love that we find written in the holy books of the major religions. “[...] *the law of life is not the law of hate, the law of force, or the law of mechanical causes; this is the law of non-life, the law of death, the law of entropy. The law which dominates life*

is the law of cooperation towards goals which are always higher, and this is true also for the lowest forms of life. In humans this law takes the form of love, since for humans living means loving, and it is important to note that these scientific results can have great consequences at all levels, particular on the social level, which is now so confused. [...] The law of life is therefore the law of love and differentiation. It does not move towards levelling and conforming, but towards higher forms of differentiation. Each living being, whether modest or famous, has its mission, its finalities, which, in the general economy of the universe, are important, great and beautiful.”

The choice of low entropy options

Materialistic culture produces life styles which are governed by the law of entropy and which lead to an increase in disorder, disorganization, pollution, conflict and destruction of the basis of life.

According to the vital needs model, in order to come out from the present situation of crisis, it is necessary to operate choices which reduce entropy and which increase syntropy. For this purpose it is important to recognize the entropic content of each choice and select those alternatives which minimize entropy. The positive effects are numerous: reduction in costs, greater physical, spiritual and emotional health, greater harmony with the environment and nature, the reduction of conflicts and crises, and generally speaking the reduction of suffering.

In our everyday life we can choose to reduce the entropic content of our life style in many ways, for example:

- *Nutrition.* It is estimated that one third of all the entropy produced by humanity is caused by what we eat. Reducing the entropy associated with what we eat can have positive effects on the environment, on society and on our own wellbeing and wealth. It is important to realize that each passage in the food chain increases entropy by 10 times. For example, moving from vegetable food to animal food, 90% of the energy and nourishment is lost. In order to reduce the entropy associated with food it is necessary to simply reduce the passages in the food chain. For this reason when we eat vegetables and fruits, instead of meat, we reduce entropy by a factor of 90%.
- *Transportation.* Another important cause of entropy is constituted by transportation, and also in this case it is estimated that one third of the entropy produced by humanity can be accounted to

transportation. Travelling is a daily activity and, also in this case, we can choose ways of transportation which can reduce entropy with positive effects on the environment, society and on our wellbeing and wealth. For example, work located near the place where we live would reduce the time required by transportation and increase our wellbeing. Stronger ties with people living in our community, leisure activities near our home, would reduce the production of entropy.

- *Industry.* The belief that material goods cause satisfaction and that people will always be unsatisfied and want more material goods has driven models of productions and development which are centered on material goods, industries and centralization of work and energy. People have moved from villages to cities and instead of satisfaction and happiness, have found loneliness, alienation and depression.

The choice of high syntropy options

In order to respond to vital needs we have developed cortical systems which produce representations of the environment. During this process rationality has become increasingly important, as it allows us to adapt to extremely different situations and to respond in an ever more efficient way to the law of entropy. However rationality is based on memory, on experience, on what we have learned, in a word, on the past, and it is therefore a process which, when not correctly guided by emotions, can lead to an increase in entropy. As was already discussed information produced by cognitive process, when not oriented thanks to emotions, tends to disperse and create entropy. It is essential, therefore, to listen to the inner voice of emotions, the voice of the heart, which usually tells us which is the direction we should follow. In order to choose highly syntropic options it is important to learn how to behave when rationality, the head, indicates one direction, while the heart indicates another.

In his autobiography “The voice of Truth”, Gandhi describes himself as a very shy person who always had great difficulties speaking to groups of people. His profession, as a lawyer, forced him to defend the interests of groups, and he found himself soon involved in public talks. Gandhi discovered that when he was saying what he felt in his heart he experienced a feeling of truth. When he let this feeling of truth guide his words, the audience could feel the truth of what he was saying. Gandhi named this feeling “The voice of Truth” and arrived at the conclusion that only when serving this inner voice he was accomplishing life.

According to the vital needs model, when we follow emotions the flow of syntropy increases and energy concentrates in the thorax area producing feelings of heat and love. The theory of syntropy implies that in the future there is more information than in the present or in the past. In other words, the future is more intelligent than the present. For this reason, when we follow emotions the intelligence and knowledge of the future flows into our present. When we are able to overcome the fear of the unknown, which always accompanies choices based on emotions, we actively increase the syntropic content of our life.

In order to operate choices with a high content of syntropy, the rule is that of following the signals of heat and love which we feel in our thorax. However, because of our inner suffering, and the strategies which we use in order to cover feelings of pain and anxiety, it is difficult to perceive these feelings of love and heat. In order to listen to our inner voice it is therefore necessary to reduce the strategies which we use in order to avoid anxiety and it is also important to calm our minds. If we observe closely the evolution of our thoughts we discover that our mind tries to establish a dialogue with the heart. The mind suggests a thought and waits for the heart to respond with a positive or negative emotion. The mind suggests another thought and waits for the heart to respond. The heart signals, with an emotion, the approval or disapproval of the thought which has been generated by the mind. When the heart stops responding to the mind, when we decide not to respond to the mind, the mind calms down and silence starts growing in our mind. When the mind becomes silent, it is easy to question the heart and receive a signal, an indication about the choice we have to make. Various techniques help to develop silence in our mind. Generally speaking these techniques are named silent meditation; examples range from Zen meditation to Quaker meetings of Friends.

Choices which take into account all the vital needs

According to the vital needs model, consumption and activities which allow to reduce feelings of emptiness and depression can quickly be transformed into necessities, as they respond to vital needs. For example alcohol is a strong anxiolytic; it operates directly on the solar plexus (or celiac plexus) as an anesthetic sedating the feelings of anxiety and pain. When people start consuming alcohol in order not to feel anxiety, the consumption of this substance replaces the vital need for love, and addiction starts. People shift from a consumption guided by pleasure to a consumption guided by necessity (to anesthetize the feelings of anxiety and pain). As soon as the effects of

alcohol vanish, anxiety emerges again and, not being able to cope with it, people feel the need to consume more alcohol, in order to sedate this feeling of pain. Similar mechanisms can be observed with the consumption of other substances.

The vital needs model suggests that economy is driven not only by material needs, but also by needs for love and meaning. From this point of view economy should be designed in order to respond to all the three vital needs together, and not just to material needs. When an activity is designed to answer only material needs it is inevitable that anxiety and depression grow.

When a working environment is designed according to mechanical, entropic, standards, in which the worker is only a small part of a great mechanism, feelings of alienation, lack of meaning and loneliness grow. In this type of environment conflicts among workers are fuelled by the search for a meaning, and consequently the quality and the quantity of production diminishes, damaging in this way not only the company, but also the worker and society. On the contrary, working environments which are organized according to syntropic standards, based on aims and goals which provide a meaning for the worker, increase satisfaction, productivity and wealth. Entropic settings can easily be recognized, as they are based on the idea that the worker is always unsatisfied and does not want to work. The relationship is not based on trust, but on control. For example, all those structures which use “badges”, are not based on trust and are designed according to entropic rules. In syntropic settings any form of control would vanish, relationships would be based on trust, and the worker would identify himself with the aims of the company.

According to the vital needs model the functions of work are at least three:

- To produce goods and services which respond to the vital needs.
- To provide a meaning for the life of the worker.
- To allow the worker to overcome his/her isolation uniting him/her with other people in a common endeavor.

When jobs are organized in order to respond to all the three vital needs, and not only to the material needs, the worker feels motivated, gives the best of himself and the productivity and quality increase. In order to obtain these results it is necessary to insert in the cost-benefit analyses and in the business plan not only material variables, but also variables which are relative to the other needs.

Broadening cost-benefit analyses to the needs for love and for meaning implies the shift from a model which is based on the assumption that people will always be unsatisfied to a model which implies that the global wellbeing of people is possible. This shift from a model based on the assumption of the eternal dissatisfaction of humanity to an economical model based on the idea that people can reach satisfaction, has the effect of reducing the consumption of material goods. This happens because a relevant part of consumption of material goods is not spurred by material needs, but by the needs for meaning and love. For example, currently people often consume material goods in order to calm their anxiety, or to feel that they can afford particular types of expenses and that they are therefore meaningful. When people learn to satisfy their need for meaning and love using the “theorem of love”, a progressive contraction in the consumption of material goods is observed and consequently a natural reduction of the entropy produced.

Widening economy to the needs for love and meaning implies that in cost-benefit analyses all the variables, also including the qualitative variables find a place. Currently cost-benefit analyses consider only few variables. For example, if we take into account how the cost-benefit analyses are made for the assessment of nuclear energy we find that the fuel used in nuclear power plants yields energy at a lower price than renewable sources of energy (biogas, solar panels, etc.) or fossil fuels (gas, petrol and coal). However, if we insert in the analyses the costs of construction of the power plant, totally different results are obtained. If we add the costs of the dismantlement of an old and radioactive power plant and the processing and stocking of nuclear waste in a safe place for 250,000 years, we discover that the cost of the energy produced by nuclear power plants is thousands of times more expensive than the energy produced by renewable sources of energy. These costs need to be taken into account because someone will have to pay for them in the future. Finally, if we add the social costs, in the form of concentration of power, risk of terrorist attacks and environmental damages linked to radiation, we discover that the cost of nuclear power is enormous.

If we do not take into account these costs they do not just disappear but they will be transformed, in the future, into public debt, financial crises or conflicts between nations. The vital needs model indicates that assessments, not only of governments but also of companies and families, should always take into account all the variables, including the qualitative variables, which concern the vital needs for love and meaning. Taking into account only quantitative variables, typical of the material need, leads inevitably to inefficient actions which cause economical, social, demographical, health and environmental crises.

Suffering, abuse of alcohol and drugs, mental illnesses, low productivity, and conflicts, can be calculated in terms of economical costs for which society will have to pay, and which will translate into public debt, inflation or financial crises.

The vital needs model considers economical crises, public debt, inflation and financial crises the consequence of models (economical, social, or organizational) which do not take into account the variables linked to the needs for love and meaning.

12. Wave function collapse?

In the classical vision of causality, in which time and causes flow from the past to the future, once an event is determined it cannot be modified. In the Copenhagen interpretation of Quantum Mechanics this is named “collapse of the wave function”. Once the wave function collapses into a particle the event is irreversible. On the contrary, when the negative solution of the Klein-Gordon’s equation is taken into account events can become reversible, within certain limits.

For example, in a study conducted by W.E. Cox (1956), on the use of commuter trains in the United States, Cox discovered a lower presence of commuters on trains which had accidents. Comparing the number of passengers who boarded trains which had accidents with the number of passengers who boarded the same train, at the same time and day of previous weeks, Cox discovered that the number of passengers on trains which had accidents was significantly inferior to what would have been expected, and that this reduction could not be explained as a consequence of chance.

According to the law of syntropy and the vital needs model, Cox’s findings can be explained in this way: emotions travel backwards in time. When involved in an accident, emotions of pain and distress are sent backwards in time and can be felt in the past in the form of premonitions and hunch feelings, which may lead, in this case, to a decision not to travel. This backwards in time effect of emotions would therefore change the future. In other words, a negative event happens in the future and informs us, through emotions. According to this theory, listening to our emotions can help us to decide differently and avoid pain and distress in our future. If we listen to our emotions the future would change. According to the vital needs model it is possible to retroact thanks to emotions, and change the present, if the emotional signals which are sent to the past are taken into consideration.

Another example. The article “*In Battle, Hunches Prove to be Valuable*”, published on the main page of the New York Times on July 28, 2009, describes that gut feelings associated with hunches and premonitions have helped soldiers to foil attacks: “*My body suddenly got cooler; you know, that danger feeling, and I said no – no!*” According to the theory of syntropy the attack happens, the soldier experiences fear and death and sends backwards in time strong emotions of fear and death (which are associated with cold feelings in the thorax region due to absence of syntropy). The soldier in the past feels these feelings of death and fear as a hunch, a gut feeling, and in this way he is pushed to make a different choice avoiding the attack and death. According to the New York Times’ article these hunch feelings have proved much more effective than the technology and billions of dollars spent in intelligence hardware by the United States military.

If the theory of syntropy is correct a fascinating interpretation of miracles can be suggested. If we are able to send strong emotions to the past, choices performed in the past could be changed and the present would change consequently. For example, according to this theory, it should be possible, to send backwards in time strong emotions which would help a person to change a past decision and thereby avoid an accident or illness. According to this interpretation emotions can change the past, and consequently the present, but always in the interest of life preservation.

13. The healing power of love

According to the vital needs model, the need for feeding on syntropy is felt as need for love. When this need is not satisfied, feelings of pain are felt in the form of anxiety and emptiness in the thorax region. When this need is totally dissatisfied, the living system is unable to support the regenerative processes which repair the damages produced by entropy, and the system dies.

Love is experimented when the flow of syntropy is strong and when the system is capable of supporting the regenerative processes. A fundamental role and correlation between love and healing is therefore expected. According to this correlation healing could result directly through love without use of medicines or surgery. The properties of syntropy show that it should be possible to act:

- on the past of the person removing the causes, the origin of the illness and observing in this

way, in the present, the illness which vanishes.

- At a distance, in a non local way. A property of the law of syntropy is non locality. The therapist could be in San Francisco and the patient in Rome, and be able to establish a non local link thanks to emotions. The therapist could in this way act directly on the patient, at a distance.
- On the soul, without using words, but manipulating the vital energies of the patient (syntropy).

14. Conclusions

The originality of this work is the language which has been used. The law of syntropy is a logical consequence of the basic equations which govern the universe: the energy/momentum/mass equation and the wave function; furthermore, the retrocausal effect can be easily observed using the parameters of the autonomic nervous system.

The law of syntropy allows to talk, for the first time in a scientific way, about emotions, feelings of love and vital energies, and the conclusions are similar to the core messages of all the main religions: the centrality of love and the healing power of love. But, with religions people usually stop at the surface of the message and start fighting one against the other, even if the core message is the same.

The auspice of the authors is that the message of love, which has always accompanied humanity, can now become reality thanks to the use of the scientific language and the widening of science to the law of syntropy.

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