Life Energy, Syntropy, Complementarity and Resonance

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Abstract

Just before Christmas 1941 Luigi Fantappiè, one of the major mathematicians of the last century, saw the possibility of interpreting a wide range of solutions (the anticipated potentials of the wave equations) which had been always rejected as impossible, but which explained a new category of phenomena, which Fantappiè named syntropic, totally different from the entropic one of the mechanical, physical and chemical laws. This insight projected Fantappiè in a new panorama, which radically changed the vision of science and of the Universe which he had inherited from his teachers and which had always been the strong and certain ground on which to base his scientific investigations. A change in the basic assumptions within the ruling theory of science since it states that there are as many forward-in-time causes as backward-in-time. Although Fantappiè was one of the foremost mathematicians of the last century, a full professor at the age of 27 and had been invited by Robert Oppenheimer to become a member of the Institute of Advanced Study, his publications on the theory of syntropy were unavailable since 1991.

Domus La Quercia is located exactly half way between the place where Fantappiè was born on September 15, 1901 (Viterbo) and the place where he died on July 28, 1956 (Bagnaia).

Introduction

In 1977 I formulated the theory of syntropy without knowing about Fantappiè's work and from a slightly different starting point. My approach to life was that of an atheist. I was trying to explain everything as the outcome of the interaction of matter and energy. But, I was not able to explain the strong emotions that I was undergoing and the need to provide a meaning to my life. Suddenly I realized that in order to remain an atheist I needed to add another "physical" level. Matter and energy were just not enough. This additional level had to have properties symmetrical to energy, instead of diverging it had to converge, instead of propagating forward-in-time it had to propagate backward-in-time. The implications were just incredible. I could see life, consciousness and the feeling of life as a consequence of this converging energy. Furthermore, life had a purpose since it was converging towards a final unitary aim. I felt the implications to be unbelievable and I could

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see them mainly in the field of psychology. This made me decide to choose the faculty of psychology, although my natural predisposition was for mathematics and physics.

My formulation of the theory of syntropy started from the assumption that another "physical" level was needed and I ended working on this hypothesis with an astrophysicist, Eliano Pessa. After my final dissertation in psychology I decided to enroll in a PhD (specializzazione) in statistics. The dean, Vittorio Castellano, immediately recognized the theory of syntropy of Luigi Fantappiè in my work, but Fantappiè's works were unavailable. Castellano was enthusiastic, but after his retirement (1985) and death (1997) no one else seemed interested in my work and I got into a standstill. In 1991 a small editor published the "*Unitary Theory of the Physical and Biological World*" of Luigi Fantappiè and I finally got to know Fantappiè's theory. In 2001 the encounter with Antonella Vannini gave new life to my work. Her theses on the theory of syntropy and her PhD work which provided experimental results and methodologies which could test this theory changed the theory of syntropy from a mere hypothesis to a scientific theory supported by strong mathematics and positive experimental results.

Converging energy

In my formulation of theory of syntropy I started from the energy/momentum/mass equation of Einstein's Special Relativity, whereas Fantappiè starts from the d'Alembert operator of the wave equation in Quantum Mechanics.

Few people are aware of the fact that the equation $E = mc^2$, probably the world's famous equation, is actually a simplification of a more complex equation that was considered unacceptable at the time. $E = mc^2$ is commonly associated with Albert Einstein, but it had been published by several others before, including the Englishman Oliver Heaviside in 1890 in his Electromagnetic Theory vol. 3, the Frenchman Henri Poincaré in 1900, and the Italian Olinto De Pretto in 1903 in the scientific journal "Atte" and registered at the "Regio Istituto di Scienze".

In deriving this equation, Einstein's predecessors made assumptions that led to problems when dealing with different frames of reference. Einstein succeeded where others had failed by deriving the formula in a way that was consistent in all frames of reference. He did so in 1905 with his equation for Special Relativity, which adds momentum to the $E = mc^2$ equation:

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

where $\boldsymbol{E}$ is energy, $\boldsymbol{m}$ is mass, $\boldsymbol{p}$ momentum and $\boldsymbol{c}$ the constant of the speed of light

This equation is known as energy/momentum/mass, but since it is quadratic, it must always have two solutions for energy: one positive and one negative.

The positive or forward-in-time solution describes energy that diverges from a cause, for example light diverging from a light bulb or heat spreading out from a heater. But in the negative solution,

the energy diverges backward-in-time from a future cause; imagine beginning with diffuse light energy that concentrates into a light bulb. This, quite understandably, was considered an unacceptable solution since it implies retrocausality, which means that an effect occurs before its cause. Einstein solved this problem by assuming that the momentum is always equal to zero; he could do this because the speed of physical bodies is extremely small when compared to the speed of light. And so, in this way, Einstein's complex energy/momentum/mass equation simplified into the now famous $E = mc^2$ equation, which always has positive solution.

But in quantum mechanics this simplification is not possible, since the spin of particles nears the speed of light; therefore the full energy/momentum/mass equation is required. In 1925 the physicists Oskar Klein and Walter Gordon formulated the first equation that combined quantum mechanics with Einstein's special relativity. But since the negative time solution was considered unacceptable, it too was rejected.

Fantappiè's formulation of the theory of syntropy starts from this point.

Werner Heisenberg, one of the most influential physicists of the 20th century, wrote to Wolfgang Pauli: "*I regard the backward in time solution ... as learned trash which no one can take seriously*" (Heisenberg, 1928). In 1926 Erwin Schrödinger removed Einstein's equation from Klein-Gordon's equation and suggested that time be treated in essentially the classical way, as only moving forward. But whereas the Klein-Gordon equation could explain the dual nature of matter (particle/wave) as a consequence of the dual causality (forward and backward-in-time causality), Schrödinger's equation was not able to explain the wave/particle nature of matter. Consequently, Bohr and Heisenberg met in Copenhagen and suggested an interpretation of quantum mechanics in which matter propagates as waves that collapse into particles when observed. This interpretation, in which the act of observation creates reality, was well accepted by the Nazi establishment of the time since it supported the idea that men are endowed with God-like powers of creation. Einstein's formula was rejected because he was a Jew and because it was felt that Jewish science undermined the power of the Third Reich. But when Schrödinger discovered how Heisenberg and Bohr had used his equation with ideological implications, he commented: "*I do not like it, and I am sorry I ever had anything to do with it.*"

Syntropy

While working on the properties of the equations that combine quantum mechanics with special relativity, Fantappiè realized that the forward-in-time solution describes energy and matter that tend towards a homogeneous and random distribution. When heat radiates from a heater, it tends to spread out homogeneously in the environment; this is the law of entropy, which is also known as heat death. Fantappiè showed that the forward-in-time solution is governed by the law of entropy (from the Greek *en* = diverging, *tropos* = tendency), whereas the backward-in-time solution is governed by a symmetric law that Fantappiè named syntropy (from the Greek *syn* = converging,

tropos = tendency). The forward-in-time solution describes energy that diverges from a cause, and requires that causes be in the past and the backward-in-time solution describes energy that converges towards an attractor, a future cause. The mathematical properties of syntropy are energy concentration, an increase in differentiation and complexity, a reduction of entropy, the formation of structures, and an increase in order. These are also the main properties that biologists observe in life and which cannot be explained in the classical (time forward) way. This realization led Fantappiè to suggest in "*The Unitary Theory of the Physical and Biological World*", published in 1942, that *life is caused by the future.*

A full professor at the age of 27 and one of the foremost mathematicians of the last century, Fantappiè failed to devise experiments that could test his retrocausal hypothesis. Seventy years later Antonella Vannini formulated the following testable hypothesis: "*if life is sustained by syntropy, the parameters of the autonomic nervous systems that supports vital functions should react in advance to stimuli.*" And indeed an impressive number of studies have now shown that the autonomic nervous system (as measured by skin conductance and heart rate) can react *before* a stimuli is shown. The first experimental study of this kind was conducted by Dean Radin and monitored heart rate, skin conductance, and fingertip blood volume in subjects who were shown a blank screen for five seconds followed by a randomly selected calm or emotional picture for three seconds. Radin found significant differences in the autonomic parameters *preceding* the exposure to emotional pictures versus the calm pictures (A review of the experiments and the description of four experiments conducted by the authors can be found in "*Retrocausality: experiments and theory*," Vannini and Di Corpo, 2011).

Thermodynamics and Life Energy

During the nineteenth century, the study and description of heat lead to a new discipline: thermodynamics. This discipline, which can be traced back to the works of Boyle, Boltzmann, Clausius and Carnot, studies the behavior of energy, of which heat is a form.

Energy exists in many different forms, and it is measured with many different units. Some of the different forms are: heat; kinetic, potential, nuclear, chemical, mass, and electromagnetic. However, modern science has not yet explained what energy is:

> "*It is important to realize that in physics today, we have no knowledge of what energy is… There is a fact, or if you wish, a law, governing all natural phenomena that are known to date. There is no known exception to this law–it is exact so far as we know. The law is called the conservation of energy. It states that there is a certain quantity, which we call energy, that does not change in the manifold changes which nature undergoes. That is an abstract idea, because it is a mathematical principle; it says there is a numerical quantity which does not change when something happens. It is not a description of a mechanism, or anything concrete; it is just a strange fact that we can calculate some number and when we finish watching nature go through her tricks and*

> *calculate the number again, it is the same...* " (Richard Feynman, Nobel Prize for physics in 1965).

The study of the transformations of heat into work led to the discovery of three laws:

1. *The law of conservation of energy*, which states that energy cannot be created or destroyed, but only transformed.
2. *The law of entropy*, which states that energy always moves from a state of availability to a state of unavailability, in which it has been dissipated in the environment. When transforming energy (for example from heat to work) part is lost to the environment. Entropy is a measure of the quantity of energy which is lost to the environment. When energy lost to the environment is distributed in a uniform way, a state of equilibrium is reached and it is no longer possible to transform energy into work. Entropy measures how close a system is to this state of equilibrium.
3. *The law of heat death*, which states that the dissipation of energy is an irreversible process, since dissipated energy cannot be recaptured and used again, and that the entropy of an isolated system (which cannot receive energy or information from outside) can only increase until a state of equilibrium is reached (heat death). This law implies that it is not possible to reach absolute zero (-273,15° Celsius) since when transforming energy a part is always lost to the environment.

Entropy is of great importance as it introduces in physics the idea of irreversible processes, such as that energy always moves from a state of high potential to a state of low potential, tending to a state of equilibrium. In this regard, the eminent physicist Sir Arthur Eddington (1882-1944) stated that "*entropy is the arrow of time*" in the sense that it forces physical events to move in a particular time direction: from the past to the future. Our experience continually informs us about entropy variations, and about the irreversible process that leads to the dissipation of energy and heat death: we see our friends becoming old and die; we see a fire losing intensity and turning into cold ashes; we see the world increasing in entropy: pollution, depleted energy, desertification. The term irreversibility entails a tendency from order to disorder. For example if we mix together hot and cold water we get tepid water, but we will never see the two liquids separate spontaneously.

The term "entropy" was first used in the middle of the eighteenth century by Rudolf Clausius, who was searching for a mathematical equation to describe the increase of entropy. Entropy is a quantity which is used to measure the level of evolution of a physical system, but in the meantime it can be used to measure the "disorder" of a system. Entropy is always associated with an increasing level of disorder. Nevertheless, the law of entropy seems to be contradicted by life: living systems evolve towards order, towards higher forms of organization, diversification and complexity, and can keep away from heat death.

Biologists and physicists have been debating this paradox:

- Schrödinger (1933 Nobel Prize for physics), answering the question of what allows life to counter entropy, responded that life feeds on negative entropy. In this way Schrödinger stated the need for a tendency symmetrical to that of entropy.
- The same conclusion was reached by Albert Szent-Györgyi (1937 Nobel Prize in Physiology and discoverer of vitamin C): *"It is impossible to explain the qualities of organization and order of living systems starting from the entropic laws of the macrocosm. This is one of the paradoxes of modern biology: the properties of living systems are opposed to the law of entropy that governs the macrocosm."* Gyorgyi suggested the existence of a law symmetric to entropy: *"A major difference between amoebas and humans is the increase of complexity that requires the existence of a mechanism that is able to counteract the law of entropy. In other words, there must be a force that is able to counter the universal tendency of matter towards chaos and energy towards dissipation. Life always shows a decrease in entropy and an increase in complexity, in direct conflict with the law of entropy."* While entropy is a universal law that leads to the dissolution of any form of organization, life demonstrates the existence of another law. The main problem, according to Gyorgyi, is that: *"We see a profound difference between organic and inorganic systems ... as a scientist I cannot believe that the laws of physics become invalid as soon as you enter the living systems. The law of entropy does not govern living systems."*

The negative solution of the energy/momentum/mass equation of Einstein's Special Relativity provides the description of a new law, symmetrical to entropy which allows to include the properties of life among the properties of the laws of physics. When this new law is accepted thermodynamics needs to be reformulated in the following way (Vannini and Di Corpo, 2012):

1. *Principle of Energy Conservation*: energy can neither be created nor destroyed, but can only be transformed.
2. *Law of Entropy*: in diverging systems (such as our expanding universe) in each transformation of energy a part of energy is released in the environment. Entropy is the magnitude by which we measure the amount of energy that is released into the environment.
    a. *Principle of death*: in diverging systems entropy is irreversible and time flows forward (Eddington's arrow of time).
3. *Law of Syntropy* (from Greek *syn*=converging, *tropos*= tendency): in converging systems energy is absorbed and concentrated leading to the increase in differentiation and complexity. Syntropy is the magnitude by which we measure the concentration of energy, differentiation and complexity.
    a. *Principle of life*: in converging systems entropy is reversible and time flows backward.

According to the new thermodynamics the law of entropy describes physical energy, whereas the law of syntropy describes *Life Energy*.

A new perspective on time and life

In order to better understand the implications of the new thermodynamics it is important to note the three typologies of time which it predicts:

1. *Causal time*, is expected in diverging systems, such as our expanding universe, and it is governed by the properties of the positive time solutions of the equations. In diverging systems entropy prevails, causes always precede effects and time move forwards, from the past to the future. Since entropy prevails, no advanced effects are possible, such as light waves moving backwards in time or radio signals being received before they are broadcasted.
2. *Retrocausal time*, is expected in converging systems, such as black-holes, and it is governed by the properties of the negative time solutions of the equations. In converging systems retrocausality prevails, effects always precede causes and time moves backwards, from the future to the past. In these systems no retarded effects are possible and this is the reason why no light is emitted by black-holes.
3. *Supercausal time* would characterize systems in which diverging and converging forces are balanced. An example is offered by atoms and quantum mechanics. In these systems causality and retrocausality would coexist and time would be unitary: past, present and future would coexist.

This classification of time recalls the ancient Greek division in: *Kronos*, *Kairos* and *Aion*.

1. *Kronos* describes the sequential causal time, which is familiar to us, made of absolute moments which flow from the past to the future.
2. *Kairos* describes the retrocausal time. According to Pitagora *kairos* is at the basis of intuition, the ability to feel the future and to choose the most advantageous options.
3. *Aion* describes the supercausal time, in which past, present and future coexist. The time of quantum mechanics, of the sub-atomic world.

According to this classification of time, syntropy and entropy coexist at the quantum level of matter, i.e. the Aion level, and at this level life can originate. A question naturally arises: how do the properties of syntropy pass from the quantum level of matter to the macroscopic level of our physical reality, which is governed by the law of entropy, transforming inorganic matter into organic matter? In 1925 the physicist Wolfgang Pauli discovered in water molecules the hydrogen bridge (or hydrogen bonding). Hydrogen atoms in water molecules share an intermediate position between the sub-atomic level (quantum) and the molecular level (macrocosm), and provide a bridge that allows syntropy (cohesive forces) to flow from the quantum level to the macroscopic level. The hydrogen bridge makes water different from all other liquids, increasing its cohesive forces (syntropy), with attractive forces ten times more powerful than the van der Waals forces that hold together other liquids and with behaviors that are in fact symmetrical to those of other liquid molecules.

For example:

- When it freezes water expands and becomes less dense. Other liquid's molecules, when they are cooled, vibrate more slowly, concentrate, solidify, become more dense and heavy and sink. With water exactly the opposite is observed.
- In liquids the process of solidification starts from the bottom, since hot molecules move towards the top, whereas cold molecules move towards the bottom. The liquid in the lower part is therefore the first which reaches the solidification temperature; for this reason liquids solidify starting from the bottom. In the case of water exactly the opposite happens: water solidifies starting from the top.
- Water shows a heat capacity by far greater than other liquids. Water can absorb large quantities of heat, which is then released slowly. The quantity of heat which is necessary to change the temperature of water is by far greater than what it is needed for other liquids.
- When compressed cold water becomes more fluid; in other liquids, viscosity increases with pressure.
- Friction among surfaces of solids is usually high, whereas with ice friction is low and ice surfaces result to be slippery.
- At near to freezing temperatures the surfaces of ice adhere when they come into contact. This mechanism allows snow to compact in snow balls, whereas it is impossible to produce balls of flour, sugar or other solid materials, if no water is used.
- Compared to other liquids, in water the distance between melting and boiling temperatures is very high. Water molecules have high cohesive properties which increase the temperature which is needed to change water from liquid to gas.

Water is not the only molecule with hydrogen bridges. Also ammonia and fluoride acid form hydrogen bridges and these molecules show anomalous properties similar to water. However, water produces a higher number of hydrogen bridges and this determines the high cohesive properties of water which link molecules in wide dynamic labyrinths. Other molecules that form hydrogen bonds do not reach the point of being able to build networks and broad structures in space. Hydrogen bonds impose structural constraints extremely unusual for a liquid. One example of these structural constraints is provided by crystals of snow. However, when water freezes the hydrogen bonds mechanism stops and also the flow of syntropy between micro and the macrocosm stops, bringing life to death. Hydrogen bond makes water essential for life, water is ultimately the lymph of life which provides living systems with syntropy. If life were ever to start on another planet, it would certainly require water.

Water provides the bridge through which the properties of syntropy flow from the quantum to the macro level of reality in which we leave. Consequently water should constantly show retrocausal properties. An example of the retrocausal properties of water is provided by homeopathy. *Homeopathy* was discovered by the German physician Samuel Hahnemann (1755-1843) in 1796. This system is based on the so called *law of similar*, according to which remedies are based on substances which cause similar symptoms in healthy individuals. Homeopathic remedies are

prepared by diluting the active substance in water (i.e., this fact suggests that homeopathy uses the retrocausal and syntropic properties of water molecules). The higher the dilution the stronger is the remedy. This technique leads to the paradox that the stronger remedies are those in which the active substance has been diluted to the point that it is practically impossible that a single molecule is still present in the remedy. Consequently, having removed the active substance, through dilution, conventional medicine states that the effects which are observed are placebo effects and cannot be attributed to the efficacy of the remedy, since no solid molecule of the active substance is present. The theory of syntropy suggests that if homeopathy is a retrocausal procedure which exploits the retrocausal properties of water, the active substance, when placed in water, creates links with causes located in the future (attractors), then removing the active substance through dilution, these retrocausal links remain and are no longer bound to the substance but free to act on any other structure. Conventional medicine considers only causes with effects which diverge towards the future. Syntropy considers causes to be in the future, whereas effects diverge backward-in-time. Consequently, for us moving from the past to the future, causality produces effects that diverge from the past, whereas retrocausality produces effects that converge towards the future, and which become nil when they reach the attractor. Therefore, when using a substance that induces, in the future of a healthy person, symptoms similar to those observed in a sick person and this substance is put in water the future starts to retroact on the present. With traditional causality, in order to increase the effect, it is necessary to increase the cause (the substance), whereas with retrocausality, in order to increase the effect, it is necessary to reduce the physical cause. When dealing with retrocausality effects work in the opposite way, according to a symmetric logic, this is why instead of increasing we need to decrease and this is why we need to work with similar. The retrocausal properties of water are enhanced by the process of dilution. Conventional medicine rejects homeopathy because the effects cannot be explained according to classical causality, by the action of causes in the past and because the active substance is completely removed from the homeopathic preparations. The therapeutic effects, however, are tangible and can be detected using the experimental method.

Syntropy, the Law of Complementarity and Unity

The first law of thermodynamics, the law of conservation of energy, states that energy is a fixed quantity which cannot be created or destroyed, but only transformed. The new thermodynamics states that energy can be transformed according to entropy (*en*=diverging, *tropos*=transformation) and to syntropy (*syn*=converging, *tropos*=transformation). When the transformation is governed by entropy energy diverges and it becomes unavailable, when the transformation is governed by syntropy energy concentrates and becomes available. An example of syntropy is provided by living systems which concentrate energy and make it available in the form of bio-masses, gas, coal, and petrol. The new thermodynamics shows that life increases the proportion of syntropy, whereas physical/mechanical systems increase the proportion of entropy and reduce the availability of energy. Since the total amount of energy remains unchanged, energy can be represented as the sum of energy in the syntropic state (concentrated) and of energy in the entropic state (dispersed):

Energy = Syntropic Energy + Entropic Energy

Energy is a fixed amount since, according to the first law of thermodynamics, it cannot be created or destroyed. Consequently energy can be replaced with the number 1 and the equation changes into:

1 = Syntropy + Entropy

which shows that entropy and syntropy are complementary parts of the same unity:

Syntropy = 1 – Entropy ***Entropy = 1 – Syntropy***

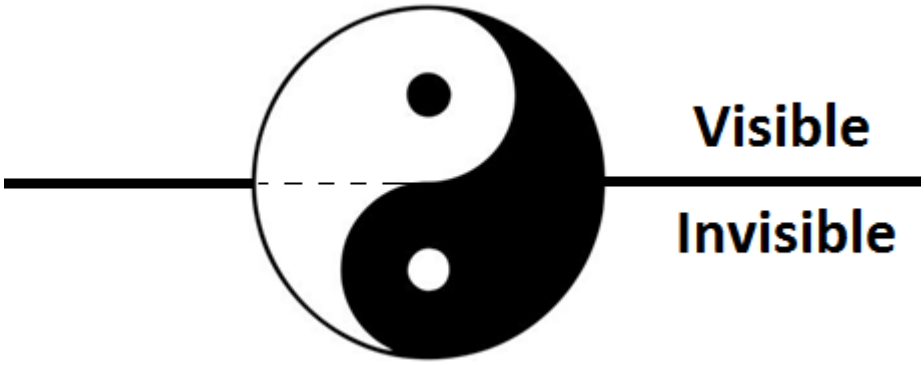
In "*Syntropy: definition and use*" Mario Ludovico states that: "*I deem it impossible to grasp the concept of syntropy without having assimilated the concept of entropy, since not only are the two concepts in a strict mutual connection but entropy and syntropy are also complementary concepts**: In other words, where it is possible to measure a level of entropy there is a complementary level of syntropy*." (Ludovico, 2008)

The new thermodynamics states that cause and effect relations are governed by the law of entropy and constitute the visible side of reality, whereas retrocausal relations (i.e. effects that precede their causes) are governed by the law of syntropy and constitute the invisible side of reality. It states that the entropic side of reality is visible since we can see its causes, whereas the syntropic side or reality is invisible since we cannot see its causes. Therefore we experience forces and entities that we cannot observe directly but which exist objectively, independently of any human perception. One such force is gravity. Let us look at a very simple example. Suppose we hold a small object like a pencil between our thumb and forefinger and then release it. We observe that it falls to the floor and we say that the force of gravity causes it to fall. But, do we actually see any downward force acting upon the pencil, something pulling or pushing it? Clearly not. We do not observe the force of gravity at all. Rather we deduce the existence of some unseen force (called gravity) acting upon unsupported objects in order to explain their otherwise inexplicable downward movement. According to the energy/momentum/mass equation half of the forces acting on reality are entropic (diverging) and visible and half are syntropic (converging) and invisible and nothing takes place without the interplay of both these forces: visible and invisible. We constantly experience observable effects that have unobservable causes, behaviors that cannot be explained observably and phenomena in the visible reality that arise from the invisible reality (Vannini and Di Corpo 2013).

Three examples are provided here about the law of complementarity: the Taoist philosophy, Hinduism and the a-causal properties of synchronicities according to Carl Gustav Jung.

- *Taoist philosophy*

In the Taoist philosophy all aspects of the universe are described as the interplay of two complementary and fundamental forces that constantly interact between themselves: the *yang* principle which is diverging, and the *yin* principle which is converging. These two forces are part of a unity. In the visible side of reality, when one increases the other decreases, but as a whole their balance remains unchanged. This law is masterfully represented in the Taijitu symbol, that is the union of these opposite principles, the yin and the yang, the diverging and converging forces whose combined action moves the universe in all its aspects: the sexes, seasons, day and night, life and death, full and empty, movement and repose, push and pull, dry and wet, etc.



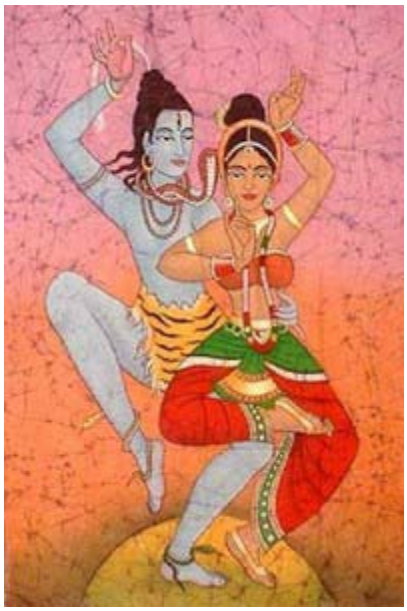
Symbol of the Taijitu and the visible and invisible reality.
Black represents yin (syntropy) and white yang (entropy).

In the Taijitu the yang principle is represented by the white color and coincides with the law of entropy, whereas the yin principle is represented by the black color and coincides with the law of syntropy. The Taijitu is a wheel that rotates constantly, changing the proportion of yin and yang (syntropy and entropy) in the visible and the invisible sides of reality.

The Taijitu shows that a principle of the law of complementarity is that *opposites attract each other*. This law is well known in physics, but it is also true at the human level where people on opposite polarities are attracted to each other. Since the balance of these opposite forces remains unchanged the Taoist philosophy suggests that *the aim is to harmonize the opposites*, thus creating unity.

- *Hinduism*

In Hinduism the law of complementarity is described by the dance of Shiva and Shakti, where Shakti is the personification of the female principle and Shiva of the male principle. They represent the primordial cosmic energy and the dynamic forces that are thought to move through the entire universe. Shiva has the properties of the law of syntropy, whereas Shakti has the properties of the law of entropy and they are constantly combined together in an endless cosmic dance.



Endless cosmic dance between Shiva and Shakti

Shakti can never exist apart from Shiva or act independently of him, just as Shiva remains a mere corpse without Shakti. All the matter and energy of the universe would be the result of this dance of the two opposite forces of Shiva and Shakti. Shiva absorbs Shakti (energy) turning it into a body and absolute pure consciousness, the light of knowledge.

According to Hinduism knowledge, intelligence and consciousness would come from the future (Shiva), whereas fearsome, ferocity and aggressiveness would come from the past (Shakti).

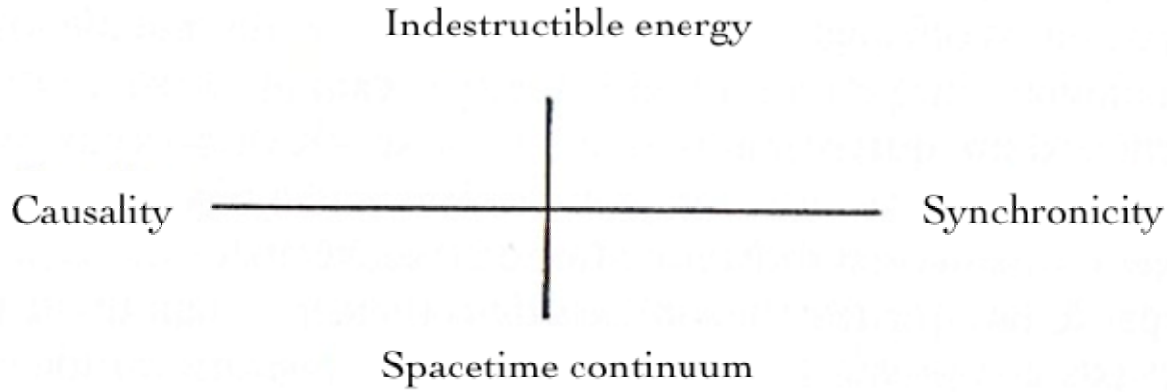
Shakti is the energy of the physical and visible world whereas Shiva is the consciousness which transcends the visible world. However, each aspect of Shiva has a Shakti component, linked to the physical world. The evolution of this endless dance between Shakti and Shiva has the function to bring life towards Unity.

- *Synchronicities*

In the psychological literature of the 20th century Carl Gustav Jung used to add synchronicities (syntropy) to causality (entropy). Synchronicities are according to Jung the experience of two or more events that are apparently causally unrelated or unlikely to occur together by chance, yet are experienced as occurring together in a meaningful manner. The concept of synchronicity was first described in this terminology by Carl Gustav Jung in the 1920s. The concept does not question, or compete with, the notion of causality. Instead, it maintains that just as events may be grouped by causes, they may also be grouped by finalities, a meaningful principle. Jung coined the word synchronicities to describe what he called "temporally coincident occurrences of acausal events." He variously described synchronicity as an “acausal connecting principle”, “meaningful coincidence” and “acausal parallelism”. Jung gave a full statement of this concept in 1951 when he

published the paper *Synchronizität als ein Prinzip akausaler Zusammenhänge* (Synchronicity - An Acausal Connecting Principle) jointly with a related study by the physicist (and Nobel laureate) Wolfgang Pauli.

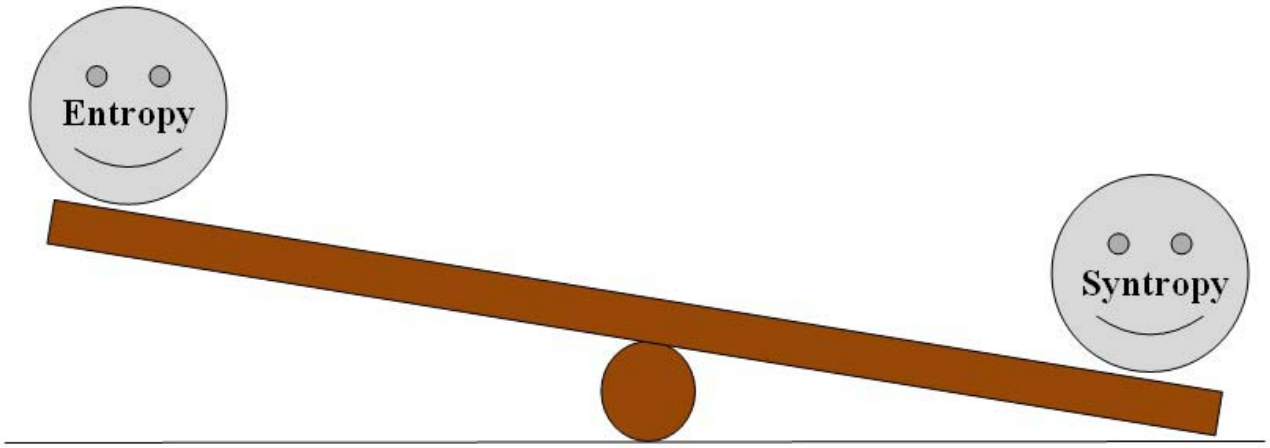
In Jung's and Pauli's description causality acts from the past, whereas synchronicity from the future. Synchronicities would be meaningful since they lead towards a finality, providing in this way a direction to events correlating them in an apparently acausal way. Jung and Pauli believed that causality and synchronicity both act on the same indestructible energy. They are united by this energy, but at the same time they are complementary.



Jung and Pauli representation of causality and synchronicity

- *Complementarity as a seesaw*

We prefer to represent the law of complementarity as a seesaw with entropy and syntropy playing at the opposite sides. This representation shows clearly how the principle of complementarity works. It tells that when entropy goes down syntropy rises and when entropy rises syntropy goes down. Consequently the visible reality of entropy can directly affect the invisible reality of syntropy, since by reducing entropy we increase the invisible properties of syntropy (such as Jung's synchronicities). Entropy is the tendency towards dissipation, suffering and death, whereas syntropy is the tendency towards cohesion, wellbeing, harmony and life.



Entropy and Syntropy constantly transform energy playing at the opposite sides of a seesaw

The law of complementarity suggests that if we want to increase wellbeing and synchronicities (syntropy) we just have to lower entropy. This can be done in several ways and, according to the law of complementarity, it affects directly the invisible side of reality increasing syntropy, wellbeing and health. When we diminish entropy, when we optimize, automatically syntropy rises and starts to manifest itself according to the invisible rules which govern this plane of reality. These rules go from intuition to Jung's synchronicities and they all lead towards advantageous options for life.

- *Anticipation*

Robert Rosen (1934-1998), theoretical biologist, professor of biophysics at the Dalhousie University, pointed out in his book "*Anticipatory Systems*" (Rosen, 1985):

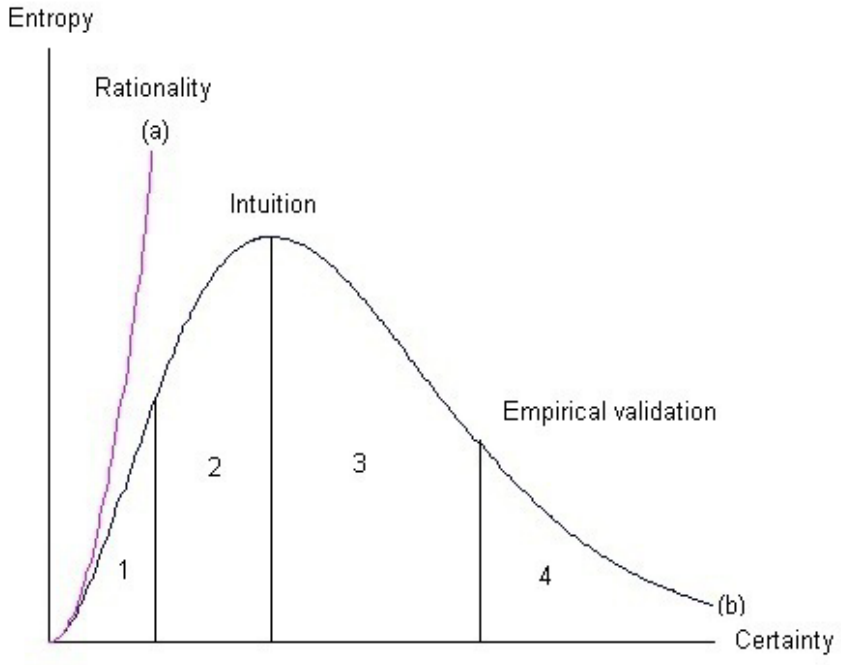
"I was amazed by the amount of anticipatory behavior observed at all levels of the organization of living systems (...) systems that behave as true anticipatory systems, systems in which the present state changes according to future states, violate the law of classical causality according to which changes depend solely on past or present causes."

Anticipatory reactions in living systems can easily be tested experimentally. For example studying the parameters of the autonomic nervous system pre-stimuli reactions are observed, the autonomic nervous system reacts in advance to future emotional stimuli. These experiments show that syntropy is felt as a feelings of warmth (since it concentrates energy) accompanied with sensations of wellbeing. When we follow feelings of warmth and wellbeing syntropy increases and guides us towards advantageous options. According to the theory of syntropy we stand in the middle of information arriving from the past and in-formation arriving from the future. We are consequently forced to choose between logical-rational thinking (forward in time information) and what the heart tells us (backward-in-time in-formation). The rational-logical thinking is based on the visible reality which is perceived as "certain", whereas feelings of the heart are based on the

invisible reality which is perceived as "uncertain". The tendency is to choose according to the logical-rational thinking of the visible reality penalizing the intuitive thinking of the heart, increasing in this way entropy and decreasing syntropy.

- *Intuition*

Feelings of warmth and well-being work like the needle of a compass that point to the correct direction. To better understand the role of these feelings it is worth quoting how Henri Poincaré used to describe intuitions (1854-1912). Poincaré noticed that when faced with a new mathematical problem he began using the rational approach of the conscious mind that allows to become aware of the characteristics and elements of the problem. But, since the options tend to be infinite and it would take much time to evaluate them all, some other type of process starts operating leading to select the correct answer. Poincaré named this process *intuition* and considered it a process which is fundamental in the production of qualitatively new information. *"The genesis of mathematical creation is a problem which should intensely interest the psychologist. To invent is to choose; but the word is perhaps not wholly exact. In mathematics the samples would be so numerous that a whole lifetime would not suffice to examine them."* Poincaré came to the conclusion that the process of discovery can be divided into four phases.



Phases of the process of discovery

These phases are:

1. A *conscious phase* which requires a period of work during which we become aware of the elements that constitute the problem.

2. An *unconscious phase* in which the elements are recombined on the basis of intuitive processes which lead to the correct solution. The solution produced by intuition is highlighted by an emotion, a feeling of *truth* in the heart that draws the attention of the conscious mind, thus leading the solution to arise to the conscious level of the mind.
3. A *phase of formalization*. What the unconscious presents to the conscious mind in the form of an intuition is not a final or complete argumentation, but rather a starting point from which the conscious mind can work out the details.
4. *A phase of validation* in which the formalized concepts are translated into hypotheses and verified.

Intuitions guide towards solutions and options which are advantageous and reduce entropy, whereas when we only follow rational processes neglecting the heart entropy increases, as it is illustrated by line (a) in the precious chart.

A similar model has been developed by Sergio Barile in the "Viable Systems Approach" (Barile, 2009).

- *Choosing advantageously*

According to the law of complementarity, when we reduce entropy syntropy rises, accompanied by synchronicities which lead us towards meaningful and advantageous aims. Synchronicities are the product of backward-in-time causality and are always associated with specific emotions. The neurophysiologist Antonio Damasio has found that people with decision-making deficits, who are not capable of performing advantageous choices, have a poor perception of their emotional experiences (Damasio, 1994). This deficit is common in people who have lesions in the frontal lobe of the brain or use substances such as alcohol, drugs and anxiolytics that "anesthetize" the perceptions of the feelings of the heart. However, people with decision-making deficits have normal and intact cognitive functions: memory, attention, perception, language, abstract logic, arithmetic ability, intelligence, learning and knowledge. They respond normally to the majority of tests, and their cognitive functions are intact and normal, but they are not able to decide appropriately for anything that concerns their future. A dissociation is observed between the ability to decide on objects, space, numbers and words and the ability to decide advantageously for the future. On the one hand, the cognitive functions are intact, but on the other hand these people are unable to use them advantageously. In neuropsychology this deficit is referred to as dissociation between cognitive abilities and their use: on one hand the cognitive functions are intact, but on the other hand, the patient is unable to use them profitably. Damasio found that deficits in decision-making are always accompanied by alterations in the ability to feel emotions and feelings, whereas cognitive abilities are intact. These people are emotionally neutral, they never have a hint of emotion, no sadness, no impatience or frustration, no positive or negative emotional reaction, they lack concern for the future, they are unable to plan for the future and make an effective program for the hours to come, they confuse priorities and lack insight and foresight. Individuals with decision-

making deficits are characterized by knowledge but not by feelings. Damasio shows that somatic sensations of the heart are primarily useful in the decision-making processes. These sensations take the form of an acceleration of the heartbeat, followed by a sensation in the lungs, in the form of a contraction of breath, and muscles. In normal subjects, who decide advantageously, Damasio observed that emotions help to orient rationality, leading it to an appropriate space in which the tools of logic can efficiently help the decision-making process. Neurological damages associated with decision-making deficits suggest that there is a set of systems which orient thinking towards the future, towards an end, and this set of systems would be at the basis of deciding advantageously and would be guided by emotions and feelings that are experienced in the form of signals from the autonomic nervous system.

Gravity is Syntropic

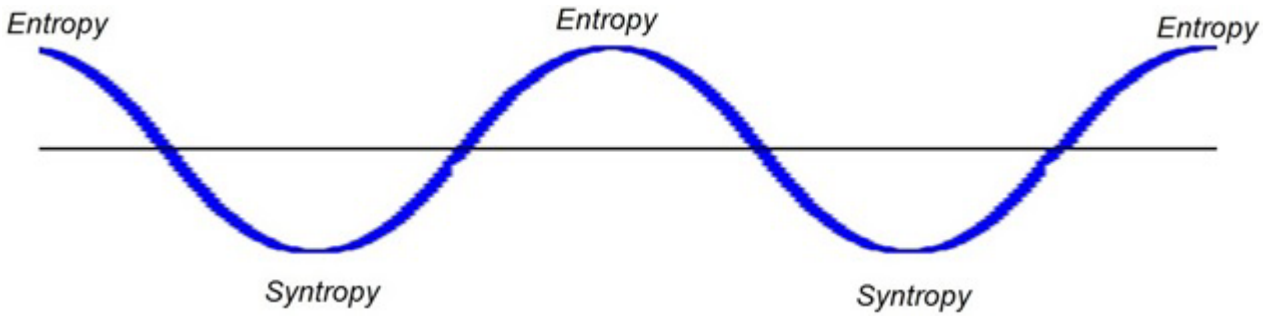
The previous chapter started with the statement that cause and effect relations are governed by the law of entropy and constitute the visible side of reality, whereas retrocausal relations (i.e. effects that precede their causes) are governed by the law of syntropy and constitute the invisible side of reality. The example used was that of a pencil held between our thumb and forefinger and then released. We observe that it falls to the floor and we say that the force of gravity causes it to fall. But we actually don't see any downward force acting upon the pencil, something pulling or pushing it. We do not observe the force of gravity at all. This examples suggests that the force of gravity is a backward-in-time force. Equations show that forward diverging forces cannot exceed the speed of light, whereas backward-in-time forces can never propagate at speeds lower than the speed of light. Consequently according to this hypothesis we should observe that gravity propagates at an instantaneous speed. This hypothesis contradicts the standard model of particle physics, which states that gravity is caused by massless particles called gravitons that emanate gravitational fields. Gravitons tug on every piece of matter in the universe and prevent gravity from propagating at speeds faster than that of light.

But can we perform experiments in order to measure the speed of propagation of gravity and test which of the two models is correct? The answer has been provided by Tom van Flandern (1940-2009), an American astronomer who specialized in celestial mechanics. To better understand what is happening, let's begin with an example: light from the Sun requires about 500 seconds to travel to Earth. So when it arrives, we see the Sun in the sky in the position it actually occupied 500 seconds ago rather than in its present position. Consequently the light from the Sun strikes the Earth from a slightly displaced angle and this displacement is called aberration. If gravity propagates with a finite speed, we would expect gravity aberration. In other words, the Sun's gravity should appear to emanate from the position the Sun occupied when the gravity now arriving left the Sun. But Van Flandern noted that observations show that none of this happens in the case of gravity! There is no detectable delay for the propagation of gravity from Sun to Earth. The direction of the Sun's gravitational force is toward its true, instantaneous position, not toward a retarded position,

according to our best observations. Gravity has no perceptible aberration and this tells us that it propagates with infinite speed.

Resonance

On one side syntropy converges energy, on the other side entropy diverges energy. This continuous interplay between entropy and syntropy produces peaks of entropy and peaks of syntropy:



Entropy and Syntropy cycles.

According to the theory of syntropy any physical body, any structure and any form of life vibrates between peaks of entropy and syntropy acquiring in time a specific vibration.

Oscillations between peaks of syntropy and peaks of entropy take the form of pulses and dynamic processes that characterize every structure. All organic and non-organic processes are actually a continuous oscillation between the two polarities of syntropy (converging) and entropy (diverging). In life, this takes the form of waves, pulsations and rhythms: the pulsations of the heart, the phases of the breath, the perception of light and sound waves, etc.

In 1665, the Dutch mathematician and physicist Christian Huygens, among the first to postulate the wave theory of light, observed that, by placing side by side two pendulums, they tended to tune their swing, as if "*they wanted to assume the same pace*". With these studies Huygens discovered the phenomenon we now call resonance. In the case of two pendulums, it is said that one makes the other resonate at its own frequency. Since all the aspects of reality vibrate, they are all affected by different forms of resonance. An example is provided by tuning forks, a structure which vibrates at a fixed frequency of 440 Hz. When a vibrating tuning fork is placed close to a "silent" tuning fork, this second tuning fork also begins to vibrate. Tuning forks vibrate only when exposed to a sound that has their same frequency. Resonance is the principle used by radio receivers to tune in to a specific radio station. Tuning in to a specific frequency allows to receive only the information sent using that frequency, all other information is not accessible. The same happens with life. For example, we perceive only what vibrates similarly to us. This process of resonance allows information to flow. As for the tuning fork that vibrates only when exposed to a sound that has its own resonance, so our ability to learn is activated only when we come into contact with vibrations similar to ours. The resonance between us and the outside world triggers the flow of specific

information and blocks other information. This selective passage of information changes over time as we change our way of resonating. The organization of life is based on the properties of resonance, and the success of an organization or an initiative depends on the way it resonates.

In humans resonance is strongly linked to emotions, since emotions tend to manifest in the form of vibrations. Emotions resonate and this process of emotional resonance is called empathy. Empathy is the ability of an individual to understand in an immediate way the thoughts and the feelings of another person. Because of the involvement of emotions resonance acquires syntropic properties and becomes a fundamental element in all the processes of spontaneous organization.

When studying organizations created by men, we are always faced with two levels of organization: the formal level which is the product of the human mind, and the informal level which is the result of the cohesive and organizational properties of resonance and emotions. These two types of organization, formal and informal, co-exist together and it is practically impossible to eliminate the informal level of organization, since it is based on natural syntropic processes of cohesion and order. Often, the informal level of organization is stronger than the formal level and must therefore be taken into due consideration.

Organizations bind and stay together largely because of resonance. This fact has always created great difficulties among managers and decision makers. There is always a difference between the formal, rational design and the real organization which is strongly affected by resonance. Formal structures are a set of rules and regulations that establish the relationships between people, tasks and roles, and determine the distribution of power. These rules are codified in contractual agreements that outline the functions of the members of the organization in official documents, organization charts, statutes, manuals and budgets, and describe the strategies and procedures of the organization. The real organization, however, is based on informal relations which are fluid and fluctuate according to resonance, emotions and alliances that are established spontaneously among people. Resonance allows people who share similar goals to identify each other. Resonance attracts some elements and rejects others and leads to the creation of networks of which we may be part, consciously or not, or may be excluded. It is on these informal networks that informal organizations gradually build, parallel to the formal organization. Informal organizations are the "real" organizations, closely governed by the laws that govern life and nature.

When a new person becomes part of an informal network he/she may begin to resonate in a different way and this can lead to a reconfiguration of the network. The informal organization is thus redefined when new people are included in it, or when people are excluded or leave. When people leave the network the resonance changes and the network boundaries are redefined. Sometimes it is simply sufficient that one person leaves in order to cause a real breakup of the informal network and in some cases of the whole organization. Informal organizations are strongly influenced by the people who are part of the network, by their way of resonating, their goals and vision. By contrast, in formal organizations functions and roles are more important than people. And since people come and go, the formal organization remains unchanged over the years.

In most organizations a continuous interaction between informal networks and formal structures is observed. Informal networks tend to be more powerful than formal roles and functions and continuously reinterpret and adapt procedures and rules. This reinterpretation facilitates people's creativity, productivity and participation in the organization. When, on the contrary, the management exerts a strong pressure on the formal level, for example with the introduction of electronic badges and forms of control which greatly reduce the space for informal networks, there is a vertical drop in productivity, creativity and job satisfaction. The formal rules and official procedures are meticulously followed, but in a non-adaptive way which reduces flexibility and creativity and the capability to respond effectively to problems, thereby blocking de facto the functioning of the organization.

The distinction between formal organization and informal organization coincides with the distinction between rational thinking, governed by the law of entropy, and intuitive thinking governed by the law of syntropy. The principle of complementarity states that the optimal situation is achieved when these two polarities are harmonized together. For this reason, in an ideal organization these two aspects must be recognized: the informal networks are supported and favored by the formal organization that incorporates them as sources of innovation, flexibility, creativity and ability to learn.

Informal networks enhance the syntropic properties of the formal organization. The goal is to minimize entropy and maximize syntropy. When managers exploit informal networks and maximize the resonance between subjects they can indeed increase syntropy, on the contrary when they focus excessively on the formal aspects entropy increases in the form of non-productivity, costs and the inability to achieve the goals and to live up to the mission of the organization.

For this reason, an experienced manager uses continuously the informal organization and leaves the routine work to the formal organization. He knows that he must rely on the informal organization for those tasks that go beyond simple routine and for the communication of information that has to spread only within a specific context, a specific informal network. He knows that the most effective way to improve the potentials of an organization is to keep the informal networks alive and strong, such as by providing social spaces where resonance and the creation of networks and alliances can spontaneously grow and develop. Sometimes just a café room, a messages board for announcements and notices, a newsletter, a library, free-time meeting places and outside activities foster the creation of informal networks and enhance resonance increasing syntropy within the organization. When these initiatives are activated and publicized people feel encouraged to be creative and set in motion processes of innovation within the organization.

The transition from a formal organization to an organization that values informal aspects, implies the evolution from an entropic culture to a syntropic culture. In entropic organizations rules are imposed from above. For example, when a message is not received the manager increases the frequency with which the message is repeated or uses sanctions. On the contrary, in a syntropic organization the mechanism of resonance filters the information and selects only what is really significant and what should be noted. What people and networks notice depends on their particular

resonance, so it is not the frequency of the message, the volume or the sanctions that allows a message to be received, but the way the message resonates within the informal networks.

In a formal organization, the focus is on control and when difficulties are encountered managers feel entitled to investigate the mode of communication between people, so that they can control and bind the informal structure of the organization. In syntropic organizations informal networks and communication are encouraged. The control of the organization depends on these networks and their flexibility, creativity and freedom is supported, without binding them to the formal structure.

Informal organizations can be promoted by reducing controls and providing people with the opportunity of being creative and developing solutions. Exceeding with instructions, commands and orders reduces the informal aspect to a point where only the entropic components grow. In the syntropic culture the aim is not to control, use power or sanctions, but to facilitate those situations and conditions which allow people to find their own meaning and to ensure that this meaning is shared with others. The transition from an entropic style, focused on formal aspects, to a syntropic style that enhances informal networks and resonance can lead to excellent results. Thanks to the qualities of informal networks the unique properties of syntropy that distinguish living systems from machines are enhanced, such as insight, vision of future scenarios and creativity. In informal networks it is no longer necessary to force people against their will and nature, with a consequent reduction in the amount of energy needed to make the organization work. What helps people to work is cohesion, resonance, the meaningfulness of their activities and a clear mission which conveys a meaningful vision of the future.

A converging teleological universe

The theory of syntropy suggests that we live in a converging teleological universe. A similar conclusion was reached by Pierre Teilhard de Chardin (1881-1955), a well-known evolutionary scientist who became famous after his death with the publication of *The Phenomenon of Man* and *Towards Convergence*. Both Fantappiè and Teilhard were subject to strong censorship for believing that causes retro-act from the future. According to Fantappiè, life is subject to a dual causality, efficient causality and final causality, and for Teilhard life is guided by final and converging aims. Teilhard argued that while astronomy detects an initial event from which the physical world originated (the Big Bang), paleontology identifies an end point towards which life is evolving and converging. Teilhard called this end point the Omega point and believed that a correct reading of sacred texts shows that the origin of life is in the future and not in the past. Teilhard's claims sparked debate within the Catholic Church and a decree of the Holy Office chaired by Cardinal Ottaviani, in 1958, asked religious congregations to withdraw the works of Teilhard from their libraries since they offend Catholic doctrine.

In the 1920s Albert Einstein theorized a cyclic model of the universe that followed an eternal series of oscillations, each beginning with a Big Bang and ending with a Big Crunch; in the interim, the

universe would expand for a period of time before the gravitational attraction of matter caused it to collapse back in and undergo a bounce. The Big Crunch hypothesis is exactly symmetrical to the Big Bang and maintains that the universe will stop expanding and begin collapsing on itself because of the strength of gravitational forces. Eventually all matter will collapse into black holes, which would then coalesce, producing a unified black hole or Big Crunch singularity, and the universe would collapse to the state where it began and then initiate another Big Bang. And so in this way the universe would last forever, but would pass through phases of expansion (Big Bang) and contraction (Big Crunch). According to this hypothesis, time flows forwards during the diverging phase (Big Bang) and backward during the converging phase (Big Crunch).

However, recent evidence - to be precise the observation of distant supernova - has led to the speculation that the expansion of the universe is not being slowed down by gravity but rather accelerating. In 1998 the measurement of the light from distant exploding stars lead to the conclusion that the universe is expanding at an accelerating rate. In the attempt to explain these observations, which contradict the hypothesis of a cyclic universe, physicists introduced the idea of dark energy. The most important property of dark energy would be its negative pressure, which is distributed relatively homogeneously in space, a kind of anti-gravitational force driving the galaxies apart.

But, on the contrary, the syntropy hypothesis suggests that the increase in the rate of expansion of the universe would not be due to the effect of dark energy or to any mysterious anti-gravitational force, but rather to the fact that time is slowing down. In June 2012, Professors José Senovilla, Marc Mars and Raül Vera of the University of the Basque Country, Bilbao, and the University of Salamanca, Spain, published a paper in the journal *Physical Review D* in which they dismiss dark energy as fiction. Senovilla says that the acceleration is an illusion caused by time itself gradually slowing down. The team proposed that there is no such thing as dark energy at all and that we have been fooled into thinking the expansion of the universe is accelerating, when in reality, time itself is slowing down.

Teilhard de Chardin considered life organized in concentric spheres. The innermost sphere is the Omega point (which coincides with the Big Crunch), in which all of matter will be transformed into organic and conscious matter. The outer sphere is the most distant from the Omega point, the realm of inanimate matter. Teilhard relates the Omega point to consciousness and Fantappiè considers syntropy the source of the Self, the feeling of life. Consciousness and the Self are attributed by Fantappiè and Teilhard to the final attractor (Omega Point / Big Crunch). The closer we evolve towards the final attractor, the more conscious we become.

Teilhard describes the law of attraction in the following way:

> "*The universe, taken as a whole, concentrates under the influence of the attraction which arises from the Omega point, which takes the form of love. People can evolve and become more human since they share at the core level the same attractor of love.*

> *According to this view we are all immersed in a converging flow of conscious energy, whose quality and quantity is growing at the same rhythm of our complexification*."

Similarly, Fantappiè associates the final aim of evolution with love, and states that:

> "*What makes life different is the presence of syntropic qualities: finalities, goals, and attractors. Now as we consider causality the essence of the entropic world, it is natural to consider finality the essence of the syntropic world. It is therefore possible to say that the essence of life is the final causes, the attractors. Living means tending to attractors ... But how are these attractors experienced in human life? When a man is attracted by money we say he loves money. The attraction towards a goal is felt as love. We now see that the fundamental law of life is this: the law of love. I am not trying to be sentimental; I am just describing results which have been logically deducted from premises which are sure. It is incredible and touching that, having arrived at this point, mathematical theorems start speaking to our heart!*"

> "*Today we see printed in the great book of nature - that Galileo said, is written in mathematical characters - the same law of love that is found in the sacred texts of 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, particularly 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.*"

Attractors and Life

The inherent complexity of the physical universe which originated from the Big Bang is a consequence of the interaction of matter and energy with the cohesive forces of the backward-in-time solution. Similarly, the complexity of the invisible universe which originated from the Big Crunch is a consequence of the interaction with the symmetrical and opposite forces of the forward-in-time solution, namely the Big Bang. It is commonly accepted that the Big Bang was made of highly concentrated and undifferentiated energy that cooled down because of the expansion of the universe and slowly clustered into atoms, galaxies, solar systems and planets, through the action of cohesive forces such as gravitation. Similarly, the Big Crunch would be made of highly concentrated energy, which diverges backward-in-time and clusters thanks to the opposing forces. Similarly to what happens in the visible universe, it is assumed that attractors have a complex structure made of a central attractor which corresponds to the Big Crunch, the final attractor or

Omega point, and smaller attractors increasingly complex in structure, but hierarchically linked to the final attractor. Consequently, syntropy would not be an undifferentiated attractor, but would be structured in complex attractors hierarchically organized, with their end point in the Big Crunch.

According to the law of syntropy life is the physical manifestation of these attractors.

Michelangelo stated that the skill of an artist is to bring out from stone the figure that is already in it. Similarly, the success of living species is to bring out the attractor which is already present in their body, thanks to continuous feedback loops with the future. The theory of syntropy thus leads to the hypothesis that the organization of living systems is guided by attractors that retroact from the future. This hypothesis suggests that genes would have the function to receive information from attractors and not to encode information from the past. This would be the reason underlying the incredible stability of species and their convergence towards common forms, and would also explain the strange results obtained by Driesch in his experiments on embryos of sea urchins, which show that in two-cell stage sea urchin, when a cell is killed, the remaining cell does not give rise to half of a sea urchin, but generates a small but complete organism. According to the theory of syntropy living systems acquire their form from their attractors, regardless of what happened in the past.

Another anomalous experimental result, that can be easily explained in terms of attractors, is Sheldrake's discovery that members of the same group, such as animals of the same species, are able to share knowledge, without using any physical transmission. Experiments show that when a mouse learns a task, this same task is learned more easily by each other mouse of the same breed. The greater the number of mice that learn to perform a task, the easier it is for each mouse of the same bread to learn the same task. For example, if thousands of mice are trained to perform a new task in a laboratory in London, similar mice learn to perform the same task more quickly in laboratories all over the world. This effect occurs in the absence of any known connection or communication between the laboratories. The same effect is observed in the growth of crystals. In general, the ease of crystallization increases with the number of times that the operation is performed, even when there is no way in which these nuclei of crystallization may have been moved from one place to another infecting the different solutions.

In order to explain this strange results Sheldrake introduced the concept of morphogenetic field:

> "*Today, gravitational effects and electromagnetic ones are explained in terms of fields. While Newtonian gravity rose somewhat unexplained by material bodies and spread into space, in modern physics fields are the primary reality and by using fields we try to understand both material bodies and the space between them. The picture is complicated by the fact that there are several different types of field. First there is the gravitational field (...) then there is the electromagnetic field (...) third, the quantum field theory (QFT), and so on.*" (Sheldrake, 1981)

Sheldrake's morphogenetic fields are a combination of the concepts of fields and energy. Energy can be considered the cause of change, the field can be considered the project, the way in which change is guided. Fields have physical effects, but are not themselves a type of energy, they guide energy in a geometric or spatial organization.

The theory of syntropy translates fields in attractors and "morphogenetic fields" in "morphogenetic attractors" or "morphogenetic retrocausality" and therefore agrees with Sheldrake's conclusions on morphogenetic fields, which would be at the basis of formative causation. Attractors are the cause of morphogenesis, evolution and the maintenance of the shape of living systems at all levels of complexity, not only on the surface, but also in internal processes.

In order to build a house we need building materials and a project (an attractor) which determines the shape of the house. If the project is different, the same building material can be used and produce a different house. When building a house there is a field that corresponds to the project. The project is not present in building materials, which can therefore be used in many different type of projects. The project gives stability and leads the building material to converge and cooperate together, despite individual differences. There is something that keeps parts together, something that contrasts the divergent forces of entropy, and these are the cohesive forces of syntropy. This example can be extended to cells, organs, trees, and living systems in general. For each species, for each type of cell and organ there is at least one attractor which coincides with what is normally called a field. Each morphogenetic field would correspond to an attractor that drives the living system towards a specific form and evolution.

In 1942, Conrad Waddington coined the term epigenetics in order to describe the branch of biology that studies the causal interactions between genes and phenotypes, i.e. the physical manifestation of the body. According to epigenetics, phenotypes are the result of inherited genetic mutations. These mutations last for the entire life and can be transmitted to the following generations through cell divisions. However, the hypothesis that the features of life can be added by means of random mutations, such as described by epigenetics, contradicts the law of entropy according to which the spontaneous formation of the smallest molecule of protein requires at least 10^{600} mutations. It should also be noted that epigenetics imply that some mysterious mechanism has placed the properties of life in genetic programs and genetic instructions.

Attractors instead would constitute the common denominator of a collectivity of individuals. For example, the attractor humanity would be the common denominator of all human beings, the attractor mice of all mice. Attractors act as relays which transmit to all individuals connected to it the solutions to problems. This mechanism would explain the results obtained by Sheldrake which show that when mice in a laboratory learn to solve a task, automatically all the mice of the same species (same attractor), around the world solve the same task more easily. Individuals interact with the physical world and their experience reaches the attractor which relays it to other individuals. If this experience is useful it is reinforced by other individuals. This mechanism leads to select and reinforce only what is useful for life. When it is reinforced also by the experience of other individuals it becomes a common project to which the DNA can connect. Genetic information

results in this way as the sum of collective experiences shared through a common attractor. Genes would not store information, but would act as antennas that connect our cells, our body, to the projects stored in the attractor. When genes are broken the communication malfunctions, the project is not received correctly and diseases emerge.

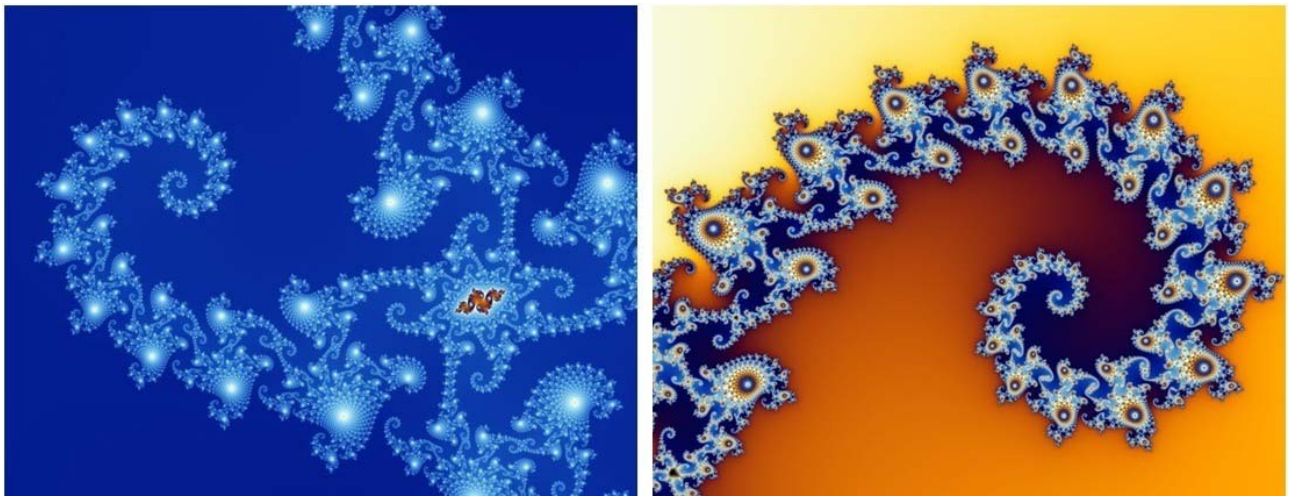
The theory of syntropy suggests that the underlying mechanism of macroevolution is explained by attractors and retrocausality, but it does not contradict the theory of evolution which would remain valid within microevolution.

Choice, free will and chaotic processes

The continuous interaction of information from the past and in-formation from the future forces living systems to make choices. This constant process of choice causes life processes to occur in a chaotic and not pre-determined form.

In 1963 the meteorologist Edward Lorenz discovered the existence of chaotic systems which react, in each point in their evolution, 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. Analyzing these unforeseeable events, Lorenz found the existence of a factor which was 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*".

When attractors interact with physical systems, fractal geometry arises. A fractal is a geometric object that is repeated in its structure the same way on different scales, that has an aspect which does not change even if it is seen with a magnifying glass. This feature is often called self-similarity. The term fractal was coined by Benoît Mandelbrot in 1975, and derives from the Latin word fractus (broken), similarly to the word fraction, since fractal images are mathematical objects of fractional dimension. Fractals are often found in complex dynamical systems and are described using simple recursive equations. For example, if we repeat the square root of a number greater than zero (but smaller than one) the result will tend to one (but it will never reach it). Number one is therefore the attractor of the square root. Similarly, if we continue to square a number greater than one, the result will tend to infinity and if we continue to square a number smaller than zero, the result will tend to zero. As shown by Mandelbrot, fractal figures are obtained when inserting in an entropic system an attractor (which tends to a limit). These complex shapes and at the same time ordered are obtained when an attractor is inserted in an equation.



Example of fractal images (source Wikipedia).

Fractal geometry reproduces some of the most important structures of living systems, and many researchers are arriving at the conclusion that life processes (from biology to economics) 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 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. Neurons show fractal structures: if neurons are examined at low magnification, ramifications can be observed from which other ramifications depart, and so on. 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 magnification. These observations support the hypothesis that the organization and evolution of living systems (tissues, nervous system, etc.) is guided by attractors in a similar way to what happens in fractal geometry.

Illness and aging are usually described a result of the wear and tear of a deterministic and orderly system which causes erratic responses of the body and of the normal periodic rhythms of the heart. In recent years it was discovered that the heart and other physiological systems behave in a fractal, chaotic, non-deterministic way, especially when they are young and healthy. On the contrary, an increase of regularity is typical of aging and disease. Irregularities, fractality and unpredictability are important features of life and health, whereas regularity is an indicators of diseases.

Complexification, unity and differentiation

From a cosmological point of view, the syntropy model states that there is a starting point, from which energy diverged (Big Bang) and a final point towards which energy converges (Big Crunch). Teilhard named the Big Bang the Alfa point and the Big Crunch the Omega point. These two diverging and converging polarities work together, but in opposite time directions. In the Big Bang,

energy explodes and diverges forward in time, but because of the Big Crunch (converging forces) energy condensates and becomes matter, atoms, stars, galaxies, increasing the complexity of the universe. Teilhard said that, as a child, one of the mysteries that fascinated him most was how matter could hold together. Speaking of a metal toy as a god of iron, Teilhard said: "*I just cannot understand how matter can stay together.*" In fact this is one of the most difficult problems of classical physics: converging forces, like gravity, are described and studied, but they are not explained. The theory of syntropy, on the contrary, provides an explanation of converging forces: matter is cohesive because of attractors that act from the future and lead energy and matter to converge. Somehow the future already exists and the Omega point towards which we are evolving is already here, but the paths to get there can be the most different. The dual solution of the fundamental equations endows us with free will and we constantly have to choose our path, and the evolution towards the Omega.

The theory of syntropy is counterintuitive not only because it states that causes can retroact from the future, but also because we usually think of unity as the disappearance and annihilation of any individuality. On the contrary, the theory of syntropy shows that when we diverge the law of entropy prevails and this leads to homogeneity and to the dissolution of individuality, but when we converge the law of syntropy prevails and we experience the increase in differentiation, complexity and diversity. In other words, when we tend towards unity our individuality becomes stronger. Unity and complexity are therefore related.

Converging increases unity and at the same time increases complexity and differentiation. The increase of cohesion and unity is therefore correlated with the increase in differentiation and complexity. "*Unity in diversity*" is a slogan that depicts these properties of syntropy. Diversity and individuality in unity are properties of the law of syntropy, whereas uniformity, homogeneity and disorder are properties of the law of entropy. Unity and diversity are the two sides of the new paradigm envisioned by the law of syntropy.

Life and the conflict between entropy and syntropy

According to the theory of syntropy the properties of life are available in the quantum level of matter and water molecules allows the flow of these properties in the macroscopic level. But, since the macroscopic level is governed by the law of entropy, which tends to destroy any form of organization, living systems are constantly struggling for survival. For example, material needs must be met such as acquiring water, food and a shelter. However, the theory of syntropy also identifies a series of intangible needs, just as vital and important as material needs, such as the need for meaning and the need for cohesion and love. When a vital need is met only partially an alarm bell is triggered. For example, if we need water thirst is triggered, if we need food hunger is triggered, if we need to provide a meaning to our life depression is triggered, if we need syntropy anguish is triggered. Depression and anguish are alarm bells, similarly to thirst and hunger, and

inform us that the vital needs for meaning and syntropy are unsatisfied. Now let us describe the vital needs which arise from the conflict between syntropy and entropy:

Combating the dissipative effects of entropy. In order to combat the dissipative effects of entropy, living systems must acquire energy from the outside world, protect themselves from the dissipative effects of entropy and eliminate the remnants of the destruction of structures by entropy. These conditions are generally referred to as material needs, or basic needs, and include:

- Combating the dissipative effects of entropy, for example, acquiring energy from the outside world through food and reducing the dissipation of energy with a shelter (a house), and clothing.
- Disposing of the production of wastes caused by entropy, i.e. hygiene and sanitation.

The total satisfaction of these needs leads to a state characterized by the absence of suffering. The partial satisfaction, however, leads to experience hunger, thirst and diseases. The total dissatisfaction of these needs leads to death.

Acquiring syntropy from the microcosm. The satisfaction of material needs does not stop entropy from destroying the structures of living systems. For example, cells die and must be replaced. To repair the damages caused by entropy, living systems must draw on the regenerative properties of syntropy that allow to create order, regenerate structures and increase organization levels. They must, therefore, acquire syntropy. In human beings this function is performed by the autonomic nervous system that supports the vital functions, such as the heart beat and digestion. since syntropy acts as an absorber and concentrator of energy:

- the acquisition of syntropy is felt as sensations of heat associated with feelings of wellbeing, in the area of the solar plexus, just under the lower part of the sternum. These feelings of warmth and wellbeing coincide with the experiences usually named love;
- the lack of syntropy is felt as a sensation of void in the solar plexus associated with feelings of discomfort and distress. These feelings coincide with the experience usually named anxiety and anguish and may come with symptoms of the autonomic nervous system such as nausea, dizziness and feelings of suffocation.

The need to acquire syntropy is experienced as need for love and cohesion. When this need is not satisfied, feelings of void and pain, usually associated to a feeling of death are felt. When this need is totally dissatisfied living systems are not capable of feeding the regenerative processes and entropy takes over, leading the system to death.

Solving the conflict between entropy and syntropy. In order to meet material needs, living systems have developed cortical structures that show the highest development in humans. These cortical systems produce representations of the world that allow to deal with the environment, but give rise to the paradox of the opposition between entropy and syntropy. Entropy has expanded the universe towards the infinite (diverging forces), whereas syntropy concentrates life, the feeling of life, in extremely limited spaces. Consequently, when we compare ourselves with the infinity of the universe, we discover to be equal to zero. On one side we feel we exist, on the other side we are aware to be equal to zero. These two opposite considerations generate the identity conflict which

was described by Shakespeare with the words: "*To be, or not to be: that is the question.*" The identity conflict can be represented using the following equation.

$$\frac{I}{Universe} = 0$$

Identity conflict equation

Which reads in the following way "*When I confront myself with the universe I am equal to nothing, to zero."*

Since the universe corresponds to entropy whereas I corresponds to syntropy the identity conflict equation can also be written as:

$$\frac{Syntropy}{Entropy} = 0$$

Identity conflict equation using Syntropy and Entropy

To be equal to zero is equivalent to death, which is the principle of death of the second law of the New Thermodynamics. This principle is incompatible with life and with the fact that we feel to be alive. The identity conflict is characterized by being meaninglessness, by lack of energy, existential crises and depression. This conflict is generally perceived in the form of tension in the head, comes together with feelings of anxiety and anguish, and is perceived as the need of acquiring a meaning. The strategies implemented in order to acquire a meaning can very: we might try to increase our value through wealth and power and we might find a meaning to our life through ideologies and religions. Strategies mainly focus on increasing the numerator, the top part of the fraction of the identity conflict equation, and / or reducing the denominator, the part below the fraction. Some examples:

Increasing the value of the numerator. One of the most common strategies used, in order to reduce depression and to provide our existence with a meaning, is to increase the value of the numerator in the equation of the identity conflict:

$$\frac{I + judgment + \ wealth + popularity + power + \ meaning \ ...}{Universe} = 0$$

By increasing the value of the numerator in the equation of the identity conflict people find temporary relief from depression, but the identity conflict is not solved, we are always equal to zero

Decreasing the value of the denominator. Another strategy commonly used in order to try to resolve the identity conflict is to decrease the value of the denominator of the equation. Rather than comparing ourselves with the universe, we reduce our interactions by limiting our universe to the community to which we belong, which is finite. However, this strategy changes the need for

meaning into the need to belong to a group, to a community. It becomes vital to be accepted and to be part of the group.

$$\frac{I\ x\ Community}{Community} = I$$

In this strategy, people seek to resolve their identity conflict limiting the outside world to a community without contact with the outside world. When the universe is replaced by the community and everything revolves around it the identity conflict is reduced.

Removing the outside world. Another strategy commonly used to try to resolve the identity conflict is to cancel the external world. In these cases the formula is transformed into:

$$\frac{I\ x\ I}{I} = I$$

In this strategy, individuals seek to resolve the identity conflict by excluding the outside world, replacing the universe with their ego.

This strategy can explain some of the main psychiatric disorders. For example, when the (I x I) multiplication is prevalent people can develop a narcissistic personality disorder. When the (I / I) fraction is prevalent there may be a paranoid personality disorder, and finally, when the (I / I) fraction and the (I x I) multiplication have similar weights, the person may be faced with a spectrum of psychotic disorders. A trait common to these disorders is the closure in oneself, and the perception of the outside world as threatening or inappropriate in relation to ones expectations.

None of the strategies which have been just described succeed in solving the identity conflict. According to simple mathematics the only way in which this conflict can be solved is the following:

$$\frac{\text{I x Universe}}{\text{Universe}} = \text{I}$$

Theorem of love

Which reads: "*When I unite with the universe, compared with the universe, I am always I*." The multiplication "x" corresponds to the cohesive properties of love and a fraction can be simplified when the numerator and denominator have common factors. In the theorem of love the common factor which can be removed is "Universe" and the equation simplifies to I = I.

This equation can also be written in the following way:

$$\frac{\text{Syntropy x Entropy}}{\text{Entropy}} = \text{Syntropy}$$

Theorem of love using syntropy and Entropy

This equation demonstrates that when we unite syntropy and entropy the identity conflict disappears, but we also enhance the third law of the New thermodynamics, the law of love. In other words, love solves the duality between syntropy and entropy and allows to experience wellbeing.

The need for a new paradigm

The tendency of life to decrease entropy and to aim towards wellbeing creates a paradox with neo-classical theories of economics which are based on the assumption that demand will always increase, since people will always be unsatisfied and want to consume more and since the population size will always increase. On the contrary the theory of syntropy states that after a period centered on material needs, people discover that wellbeing and health require a contraction in consumptions. This is probably one of the reasons of the crisis we are now witnessing. On the contrary neo-classical economic theories are based on the assumption of endless increase in consumption, and this assumption is now proving to be wrong. Modern history has shown that this assumption is true only in developing or under-developed countries, whereas in developed countries population size and consumptions automatically tend to stabilize and then to decrease.

According to some estimates of the Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat the peak in World population size was reached a couple of years ago, and now the World is starting to experience a stable population which in some years could start reducing in size. Nevertheless, neo-classical economists continue to pretend that the size of the population will continue to increase and some even forecast that the World population will reach 30billion people by the end of the century.

Either way, the transition from under-development to developed is always accompanied with dramatic changes in the demographic structure of the population. The demographic structure of the population can be exemplified using the age pyramid representation. The name age pyramid comes from the fact that until few decades ago the population structure was similar to a pyramid: many young people and few elderly one. The age pyramid is divided in two distributions: on the left that of males and on the right that of females. This representation allows to describe with one image the population structure and its dynamics and future scenarios.

Age pyramids show that when a country shifts from a state of under-development and enters a state of development the age representation shifts from that of a pyramid to that of a spin top.

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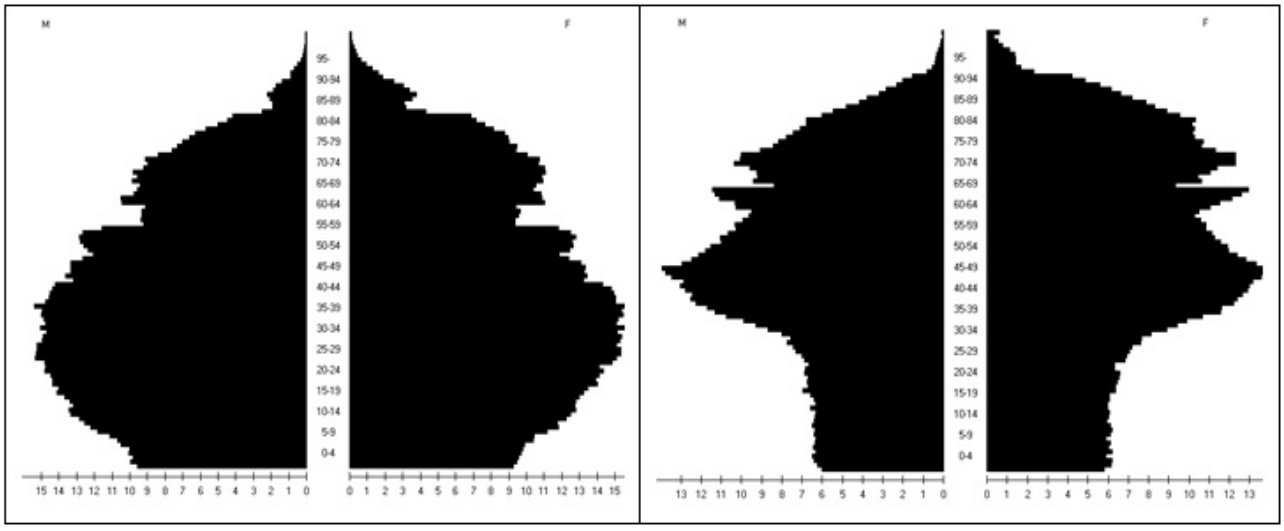
Since the young and the adult population are the main source of consumption, the contraction of their age groups automatically decreases consumptions. The demographic age structure with a high proportion of young and a low proportion of elderly people supported the neo-classic economic theories based on the assumption that consumptions will always increase. The new demographic structure, where young people are becoming rare and elderly people are becoming the majority, tells that we are headed towards a decrease in the demand of products. Furthermore, we are now witnessing a sudden increase in the death rate of elderly people and this growing number of deaths among elderly people is flooding the market with properties which are not finding an adequate demand since the number of young adults is decreasing.

1990 **2010**



Age pyramid transition in Italy in the last 20 years

The same demographic trend is starting to show in newly developed countries, such as China and India. The decreasing size of the population implies the decrease in consumptions and this trend will last for almost other 20 years. The belief that we will get out of the financial and economic crisis when consumptions will start growing again is a false belief which is leading the World towards unsustainable scenarios which increase crises and risks of a meltdown of the financial and monetary systems.

Probably it is now time for a shift in paradigm, towards a new paradigm based on the decrease of consumption and the increase of syntropy, wellbeing and health.

Final considerations

Science is now based on the assumption that causes must always precede effects and this assumption is at the basis of the duality between entropy and syntropy and neglects the role of syntropy and the evolution of life towards love. The law of love and syntropy do not imply a new type of energy. It is always the same energy, but with a tendency which is symmetrical to entropy. Entropy is incompatible with life, since it leads to death. Consequently the cause and effect assumption on which science is now based is misleading and probably is the main cause of the increase of entropy which we are now observing. Consequently, in order to overcome crises and suffering the theory of syntropy points to the fact that humanity needs to shift from the cause and effect paradigm to the new supercausal paradigm which is envisioned in the *New Thermodynamics*.

References

Barile S (2009), *Management Sistemico Vitale*, Giappichelli Editore, Torino 2009.

Damasio A.R. (1994), *Descarte's Error. Emotion, Reason, and the Human Brain*, Putnam Publishing, 1994.

Fantappiè L. (1942), *Sull'interpretazione dei potenziali anticipati della meccanica ondulatoria e su un principio di finalità che ne discende*. Rend. Acc. D'Italia, 1942, 4(7).

Heisenberg W. (1928), *Letter to W. Pauli*, PC, May 3, 1928, 1: 443.

Lorenz E. (1963) *Deterministic Nonperiodic Flow*, Journal of the Atmospheric Sciences, 1963, Vol.20, No.2, pp.130-140.

Ludovico M (2008), *Syntropy: Definition and Use*, Syntropy Journal, 1: 139-201.

Mandelbrot B.B. (1987) *Gli oggetti frattali*, Einaudi, Torino 1987.

Rosen R. (1985) *Anticipatory Systems*, Pergamon Press, USA 1985.

Sheldrake R (1981), *A New Science of Life: The Hypothesis of Formative Causation*, Blond & Briggs, London, 1981.

Szent-Gyorgyi, A. (1977) *Drive in Living Matter to Perfect Itself*, Synthesis 1, Vol. 1, No. 1, 14-26;

Teilhard de Chardin P. (2004), *Verso la convergenza. L'attivazione dell'energia nell'umanità*, Gabrielli Editori, Verona, 2004.

Teilhard de Chardin P. (2008), *Il fenomeno umano*, Queriniana, Brescia, 2008.

Van Flandern T. (1996), *Possible New Properties of Gravity*, Astrophysics and Space Science 1996, 244:249-261.

Van Flandern T. (1998), *The Speed of Gravity What the Experiments Say*, Physics Letters A, 1998, 250:1-11.

Van Flandern T. and Vigier J.P. (1999), The Speed of Gravity – *Repeal of the Speed Limit*, Foundations of Physics, 1999, 32:1031-1068.

Vannini A. and Di Corpo U. (2011), *Retrocausality: experiments and theory,* Kindle Editions, ASIN: B005JIN51O.

Vannini A. and Di Corpo U. (2009), *A Retrocausal Model of Life*, in *Filters and Reflections. Perspective on Reality*, ICRL Press, Princeton, NJ, USA, 2009.

Vannini A. and Di Corpo U. (2010), *Collapse of the wave function? Pre-stimuli heart rate differences*. NeuroQuantology, 2010, 8(4): 550-563.

Vannini A. and Di Corpo U. (2011), *Entropy and Syntropy. Causality and retrocausality in physics and life sciences: the Vital Needs Model*. Lambert, Germany, 2011.

Vannini A. and Di Corpo U. (2012), *The New Thermodynamics and Life*, Syntropy 2012 (2): 33-46.

Vannini A. and Di Corpo U. (2013), *Syntropy, the Law of Complementarity and Unity*, Syntropy 2013 (1): 83-92.