

Introduction

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Aim of the work

The purpose of this work is to describe the qualities and implications, in the field of psychology, of two principles which can be observed in the physical and biological world: the principle of entropy and the principle of syntropy.

In special relativity the equation energy/momentum/mass relates energy **E**, momentum **p** (speed) and mass **m** of an object: $E^2 = c^2p^2 + m^2c^4$. In order to calculate the resulting energy it is therefore necessary to operate a square-root, which always has dual solutions: a positive one (+E) and a negative one (-E). According to special relativity, positive energy (+E) travels from the past to the future (causality), while negative energy (-E) travels backwards in time, from the future to the past (retrocausality).

In 1942 Luigi Fantappiè, one of the major Italian mathematicians, noted that the mathematical properties of those phenomena which are determined by past causes (+E), such as the physical and chemical processes, correspond with the law of entropy, while the mathematical properties of those phenomena which are attracted towards causes located in the future (-E), agree with a symmetrical law which Fantappiè named syntropy.

Entropy is described by the second law of thermodynamics which states that 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 this energy is distributed in a uniform way (ie where no differences in heat exist), 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 also known as "heat death".

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Syntropic phenomena, on the contrary, are characterized by the tendency towards the concentration of energy, differentiation and order, which keep the system away from heat death.

Fantappiè immediately realized the coincidence between the mathematical properties of syntropy and the properties of living systems and presented his findings, on the 30 October 1942, at the Accademia d'Italia in the form of a volume titled "The Unified Theory of the Physical and Biological World" (Fantappiè, 1942).

Empirical evidence of anticipation and retrocausality in psychology

Various empirical evidence show the existence of retrocausality and anticipatory effects in living systems. In this work 3 experiments will be examined and one will be replicated.

Pre-stimuli heart rate differences

In his article "*Heart Rate Differences between Targets and Nontargets in Intuitive Tasks*" (Tressoldi and coll., 2005), Tressoldi and coll. report the results of two experiments, aimed at investigating pre-stimuli heart rate changes. In the first experiment a statistical significance (error risk) of $p=0,015$ was obtained, while in the second experiment p reached 0,001. These results support the hypothesis that the heart rate reacts before the stimulus takes place (anticipatory effects).

Anticipatory reaction of skin conductance

In 2003 Spottiswoode and May of the Cognitive Science Laboratory replicated Bierman and Radin (1997) experiments which show an increase in skin conductance 2-3 seconds before emotional stimuli are presented. Spottiswoode and May replicated these results with a statistical significance of $p=0,0005$, and performed controls in order to exclude all possible

artifacts and alternative explanations. These results support the hypothesis that the autonomic nervous system reacts in advance to stimuli (Spottiswoode and May, 2003).

Retrocausality in REG (Random Event Generator) experiments.

In 1979 the PEAR (Princeton Engineering Anomalies Research) laboratory was established under the direction of Robert Jahn, Dean of the University's School of Engineering and Applied Sciences. The purpose of this laboratory was to replicate and study the results obtained by a student which showed anomalous mind/machine interactions when using REG systems (Random Event Generator). PEAR and a consortium of other universities have replicated these results, and are now studying their implications. The anomalous mind/machine interaction which is observed is very simple: REG systems produce ultra-precise gaussian distributions, but when a subject tries to distort these distributions only by the expression of his intentionality, statistically significant deviations are observed. Even more fascinating is the fact that those distributions which have been produced before the subjects expression of intentionality show an amplified effect. The statistical significance of these amplifications is $p < 0,000000001$ (Jahn, 2005).

Replication of REG experiments

Considering the fact that it is now possible to produce highly precise REG distributions with modern PC, we have decided to replicate these REG experiments.

The first experiment was aimed to study the "local" (same moment, same place) interactions between intentionality and REG distribution. Data shown in Fig. 1 was produced by a subject who was trained for a two weeks period and who reached a statistically significant effect distorting the "Low" and the "High" distributions.

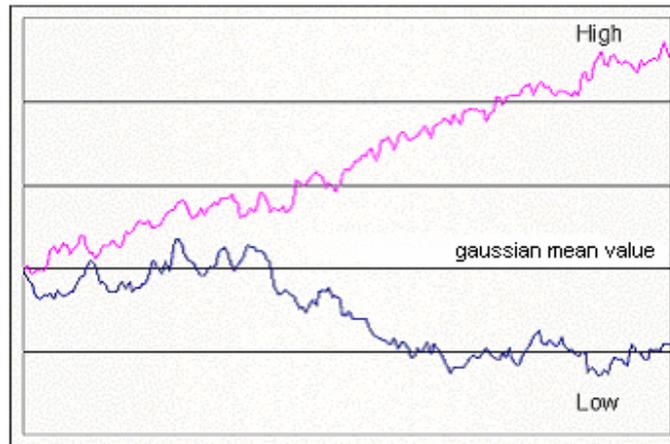


Fig. 1 Cumulative distribution of High and Low effects.
Local modality, N=396, $p < 0,005$

In the retrocausal experiment, in which the REG distribution was produced two hours before the expression of the intentionality of the subject, effects were observed only for the High distribution (Fig. 2).

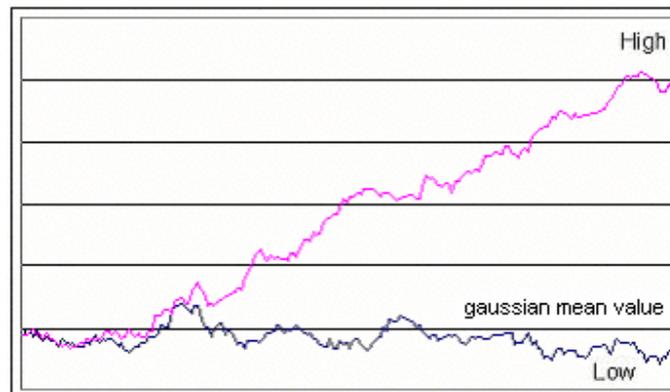


Fig. 2 Cumulated distribution of High and Low effects.
Retrocausal modality, N=396, $p < 0,0005$

Fig. 2 allows to value the difference between a random distribution (the Low distribution) which remains in the proximity of the gaussian mean value, and a non-random distribution (the High distribution) which shows a steady increase in the effect, and which progressively diverges from the gaussian mean value.

The fight of living systems against entropy

In 1927 Sir Arthur Eddington proved that entropy forces time to flow from past to future, introducing the expression "*the arrow of time*" (Eddington, 1927). In 1982 the astrophysicists Frautschi demonstrated that in our expanding universe entropy can only increase and that this is the reason why the macroscopic laws are governed by entropy and time flows from the past to the future (Frautschi, 1982). In 1974 Monod confirmed that it is impossible to explain the properties of life commencing from laws which are governed by the principle of entropy (Monod, 1974).

On the contrary, in the microcosm, at the level of quantum physics, symmetry between entropy and syntropy is observed, and past, present and future coexist. At this level syntropic processes can take place and syntropic systems (life) can be explained.

Syntropic systems show the tendency to grow towards higher forms of complexity and order. But, as soon as they grow beyond the dimension of a few hundred atoms, they enter in the macroscopic world and start conflicting with the law of entropy which governs this level.

Analyzing the conflict between syntropic systems and entropic environment Ulisse Di Corpo presented in 1981 a model of needs which describes 3 main groups of conditions which living systems need to satisfy in order to stay alive:

- **Material needs:** in order to survive living systems need to balance the dissipative effects of entropy, acquiring energy from the environment (for example from food), and protecting themselves from the destructive effects of energy, for example using a shelter, clothes, and following sanitary rules.
- **Unity needs:** Albert Szent-Gyorgyi, Nobel 1937 and discoverer of vitamin C, introduced the property of syntropy in order to explain the qualities of organization and order of the living systems (Szent-Gyorgyi, 1977); Schrödinger (Nobel 1933) stated that living systems maintain their organization and order feeding on negative energy (-E) and that this process is essential for the survival of living systems (Schrödinger, 1988). Experiments on retrocausality and anticipation suggest that the autonomic nervous system

(neurovegetative) may be dedicated to the acquisition of $-E$; $-E$ concentrates energy, therefore a good unity with $-E$ would be perceived as feelings of warmth and well being in the regions governed by the autonomic nervous system (thorax region), whereas an insufficient unity with $-E$ would be felt as emptiness and feelings of cold. These feelings are nowadays described with the word *anguish* (angst).

- **Meaning needs.** Living systems with highly developed cortical systems produce representations of reality and of themselves, and continuously face the paradox produced by the opposite polarities syntropy/entropy. Entropy, diverging waves, has infinitely inflated the universe, while syntropy which consists of converging waves makes life small and finite. When we compare ourselves (finite) with the environment (infinite) we discover we are equal to nothing ($1/\infty=0$). This identity conflict: to be (1) and not to be (0) consumes energy and increases entropy. When this conflict is not solved entropy dissipates vital energies and we feel meaningless, useless, and equal to zero. This trait is nowadays associated with the word *depression*. It is therefore necessary to solve this conflict by finding a meaning in life.

Empirical evidence

Two empirical hypothesis of this model of needs have been verified:

1. *Hypothesis n.1:* the solution to the identity conflict is obtained when $(1 \times \infty)/\infty=1$; in other words when we unite ourselves to the outer world, satisfying the need of unity, we confirm our identity, and solve the need of meaning. It is therefore logical to believe that anguish and depression are linked together in a mathematical way.
2. *Hypothesis n.2:* suffering is a consequence of one or more unsatisfied needs. It is therefore reasonable that items which describe suffering show their highest correlations with items of depression, anguish, uselessness and loneliness.

In order to verify these hypothesis the relational methodology was used. This methodology

was presented in 1843 by John Stuart Mill, when he discovered that beside the experimental method (which is based on the study of differences among groups) another method could be used which studies concomitances among variables. The relational methodology allows to use jointly qualitative and quantitative, objective and subjective data, and is not affected by the social mask which people usually use when direct questions are asked (Stuart Mill, 1843). These hypotheses have been studied using 974 questionnaires answered by teenagers of the province of Teramo (Italy). This choice was suggested by the fact that the questionnaire was devised by psychologists and psychiatrists who had no information about the model of vital needs tested in this study. The questionnaire contains items relative to suffering, depression, anguish, uselessness and loneliness, and items relative to other psychological theories about the quality of life.

Results

1. Data analysis shows that the connection between the items "I feel depressed" and "I feel anguished" reaches the highest Chi Square value (on a total of 18.915 possible correlations) of 507.08. The 1% statistical significance was reached at 6.635; similar forms of the same item obtained values of 300. These results show a perfect correlation between depression and anguish supporting the hypothesis that these two different forms of suffering are linked by a mathematical equation.
2. Items which express suffering such as "I feel unsatisfied", "I feel unhappy" and "I feel sad", show their highest correlations with "I feel depressed", "I feel anguish", "I feel useless" and "I feel lonely" reaching Chi Square values which are at least 4 times greater than those reached by other models.

These results have been replicated in other studies.

Causality and retrocausality, a model of consciousness

In the article “*Chaos, Quantum-transactions and Consciousness*” Chris King shows that from Einstein’s energy/momentum/mass equation it is possible to derive a model of consciousness which is new and innovative (King, 2003).

According to King, the dual causality which derives from the energy/momentum/matter equation, puts living systems in front of bifurcations (past/future) forcing them to operate choices which cannot be determined in advance. According to King this constant state of choice explains “free will”. Free will would therefore be a quality of all living systems, from the molecules to the macrostructures. As a consequence of their independent behavior, living systems would show chaotic dynamics and non deterministic processes. The mathematics of chaos shows that when attractors are inserted in a chaotic systems two effects appear:

- Order appears in the form of fractal structures;
- Small perturbations can be selected and amplified (the famous Lorenz attractor: “*The flap of a butterfly’s wing in Brazil can set off a Tornado in Texas*”).

King starts from these considerations and underlines two different levels of description of consciousness. In the first level, free will transfers information from mind to brain; in the second level information is transferred from brain to mind through the selection and amplification of signals (for example sensorial signals which are received by peripheral receptors, but also inner signals) operated by the fractal structures of the brain. According to King, these two levels of description are the two sides of the same coin.

Structure of this work

The work is organized in 8 chapters:

1. The first chapter, "*time as variable: from Galileo's to Einstein's relativity*", analyzes the concept of time and causality starting from Galileo's relativity and arriving to Einstein's relativity.
2. The second chapter, "*The dual solution of energy and supercausality*" analyzes supercausality, Einstein's *Übercausalität*, according to which reality is a consequence of causes located in the past (mechanical causation) and causes located in the future (retrocausality).
3. The third chapter, "*Empirical evidences of retrocausality*" describes experiments which support the existence of retrocausality and anticipatory effects in human beings.
4. The fourth chapter, "*Negative energy, syntropy and living systems*", introduces Fantappiè's Unitary Theory of the Physical and Biological World, according to which the qualities of life are associated with the properties of syntropy.
5. In the fifth chapter, "*Life's struggle against entropy*", the model of needs which derives from the introduction of syntropy is described.
6. In the sixth chapter: "*Causality, retrocausality and consciousness*", the model of consciousness which originates from supercausality is described.
7. In the seventh chapter, "*The methodology of concomitant variations*", the characteristics of the methodology of concomitances, introduced by Stuart Mill in 1843, are described.
8. In the eight chapter, "*Empirical evidence*", two empirical hypothesis which originate from the model of needs are verified using the methodology of concomitant variations.