Supercausality

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CONTENTS

PROLOGUE

Supercausality implies a change of paradigm, according to which life is finalized and guided by attractors, and wellbeing is reached converging towards these attractors.

Supercausality merges qualitative with quantitative, objective with subjective, visible with invisible, opening the way to a new era in which science and spirituality merge in a new vision of reality.

The applications and implications of supercausality touch all the fields of life and have great consequences at

the personal level which is now so confused and tormented.

Supercausality is based on a concept of time and causality which is at first counterintuitive. However, it is simple, has important implications and it is accessible to all, scientists, and non-scientists.

ENTROPY AND SYNTROPY

The notion of energy comes from the fact that physical systems possess a quantity that can be turned into a force. Even though it is used and studied Feynman noted that "*it is important to realize that in physics today we have no knowledge of what energy is.*"[1]

The energy-mass relation $E=mc^2$ that we all associate with Einstein, was first published by Oliver Heaviside in 1890[2], then by Henri

[1] Feynman, R., *The Feynman Lectures on Physics*, vol. 1 chapter 4: http://www.feynmanlectures.caltech.edu/I_04.html

[2] Auffray, J.P., *Dual origin of* $E=mc^2$: http://arxiv.org/pdf/physics/0608289.pdf

Poincaré in 1900[3] and by Olinto De Pretto in 1904[4]. Olinto De Pretto presented it at the *Reale Istituto Veneto di Scienze* in an essay with a preface by the astronomer and senator Giovanni Schiaparelli. It seems that this equation reached Einstein through his father Hermann who was responsible for the lighting systems in Verona and who, as director of the "*Privilegiata Impresa Elettrica Einstein*", had frequent contacts with the Fonderia De Pretto that produced the turbines for electricity.

However, *the* $E=mc^2$ does not consider the momentum, which is

[3] Poincaré, H., Arch. néerland. sci. 2, 5, 252-278 (1900)

[4] De Pretto O., Lettere ed Arti, LXIII, II, 439-500 (1904), Reale Istituto Veneto di Scienze: www.cartesio-episteme.net/st/mem-depr-vf.htm

also a form of energy, and in 1905 Einstein added the momentum (p), thus obtaining the $E^2=m^2c^4+p^2c^2$ equation. Since energy is squared (E^2) and in the momentum (p) there is time, a square root is used and there are two solutions: negative time energy and positive time energy. Positive time energy implies causality, whereas negative time energy implies retrocausality: the future that acts backwards into the past. This was considered impossible and to solve this paradox Einstein removed the momentum, given the fact that it is practically equal to zero compared to the speed of light (c). In this way, he returned to the $E=mc^2$.

Though, in 1924 the spin of the electrons was discovered. The spin is an angular momentum, a rotation of the electron on itself at a speed close to that of light. Since this speed is very high, the momentum cannot be considered equal to zero and in quantum mechanics the energy-momentum-mass equation must be used with its uncomfortable dual time solution.

The first equation that combined relativity and quantum mechanics was formulated in 1926 by Oskar Klein and Walter Gordon and has two solutions: advanced and delayed waves. Advanced waves were rejected, since they imply retrocausality which was considered

impossible. The second equation, formulated in 1928 by Paul Dirac, also has two-time solutions: electrons and neg-electrons (now called positron). The existence of positrons was proved in 1932 by Carl Andersen.

However, retrocausality was considered unacceptable and the backward-in-time solution was declared impossible.

Luigi Fantappiè, born in Viterbo (Italy) on the 15th of September 1901 and graduated in pure mathematics at the age of 21 at the Normale di Pisa, the most exclusive Italian University, and full professor at the age of 27, was well known and appreciated among physicists to the point that in 1951 Oppenheimer invited him to become

a member of the Institute for Advanced Study in Princeton and work directly with Einstein.

As a mathematician Fantappiè could not accept that half of the solutions of the fundamental equations were rejected and in 1941, while listing the properties of the forward and backward in time energy, Fantappiè discovered that forward in time energy is governed by the law of entropy, whereas backward in time energy is governed by a complementary law that he named syntropy, combining the Greek words *syn* which means converging and *tropos* which means tendency.

Listing the mathematical properties of syntropy Fantappiè discovered:

energy concentration, increase in differentiation, complexity, and structures: the mysterious properties of life! And in 1944 he published the book "*Principi di una Teoria Unitaria del Mondo Fisico e Biologico*"[5] (Unitary Theory of the Physical and Biological World) in which he suggests that the physical-material world is governed by the law of entropy and causality, whereas the biological world is governed by the law of syntropy and retrocausality.

We cannot see the future and therefore retrocausality is invisible! The dual energy solution suggests the existence of a visible reality (causal

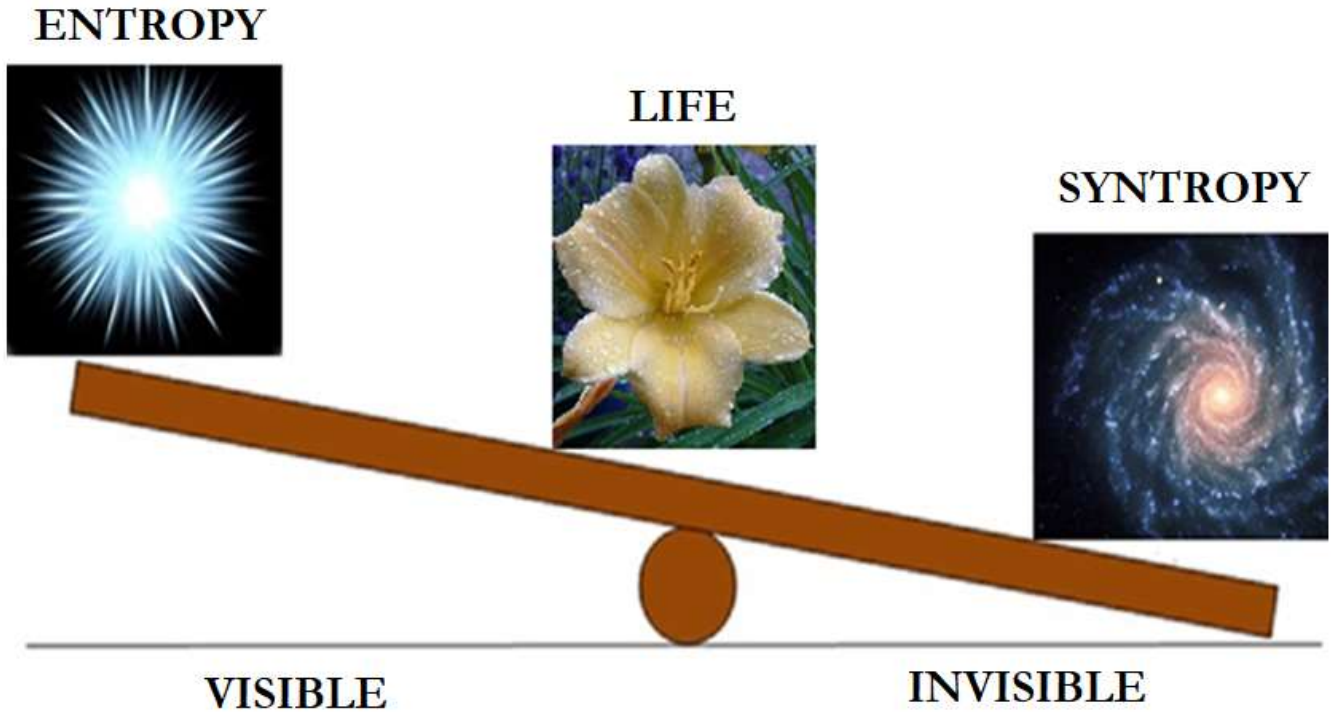
[5] Fantappiè, L., *Principi di una teoria unitaria del mondo fisico e biologico*. Humanitas Nova, Roma 1944: www.amazon.it/dp/B07RYVS89S

and entropic) and an invisible reality (retrocausal and syntropic).

The first law of thermodynamics states that energy is a constant, a unity that cannot be created or destroyed but only transformed, and the energy-momentum-mass equation suggests that this unity has two components: entropy and syntropy. We can therefore write $1 = Entropy + Syntropy$ which shows that syntropy is the complement of entropy.

Syntropy is often mistaken with negentropy. However, it is fundamentally different since negentropy does not take into account the direction of time but considers time only in the classical way: flowing forward.

Life lies between these two components: one entropic and the other syntropic, one visible and the other invisible, and this can be portrayed using a seesaw with entropy and syntropy playing at the opposite sides, and life at the center.



This suggests that entropy and syntropy are constantly interacting and that all the manifestations of

reality are dual: emitters and absorbers, particles and waves, matter and anti-matter.

Fantappiè failed to provide experimental proof to his theory, since the experimental method requires the manipulation of causes before observing their effects. Recently, random event generators (REG) have become available. These systems allow to perform experiments in which causes are manipulated after their effects: in the future.

One of the first experimental studies on retrocausality, by Dean Radin[6] of

[6] Radin, D.I., Unconscious perception of future emotions: An experiment in presentiment, Journal of Scientific Exploration, 1997, 11(2): 163-180: http://deanradin.com/articles/1997%20presentiment.pdf

IONS (Institute of Noetic Sciences), measured heart rate, skin conductance and blood pressure in subjects who were presented with blank images for 5 seconds followed by images that, based on a random event generator, could be neutral or emotional. The results showed a significant activation of the parameters of the autonomic nervous system before the presentation of emotional images.

In 2003, Spottiswoode and May[7], of the Cognitive Science Laboratory, replicated this experiment by performing a series of controls to

[7] Spottiswoode, P., and May, E., *Skin Conductance Prestimulus Response: Analyses, Artifacts and a Pilot Study*, Journal of Scientific Exploration, 2003, 17(4): 617-641: pdfs.semanticscholar.org/4043/2bc0a6b83f717dca2349b189ebdcbe7b3df9.pdf

study possible artifacts and alternative explanations. The results confirmed those already obtained by Radin. Similar results were obtained by other authors, such as McCarthy, Atkinson and Bradley[8], Radin and Schlitz[9] and May, Paulinyi and Vassy[10], always using the parameters of the autonomic nervous system.

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[8] McCarthy, R., Atkinson, M., and Bradley, R.T., *Electrophysiological Evidence of Intuition: Part 1*, Journal of Alternative and Complementary Medicine; 2004, 10(1): 133-143: https://www.ncbi.nlm.nih.gov/pubmed/15025887

[9] Radin, D.I., and Schlitz, M.J., *Gut feelings, intuition, and emotions: An exploratory study*, Journal of Alternative and Complementary Medicine, 2005, 11(4): 85-91: www.ncbi.nlm.nih.gov/pubmed/15750366

[10] May, E.C., Paulinyi, T., and Vassy, Z., *Anomalous Anticipatory Skin Conductance Response to Acoustic Stimuli: Experimental Results and Speculation about a Mechanism*, The Journal of Alternative and Complementary Medicine. August 2005, 11(4): 695-702: www.ncbi.nlm.nih.gov/pubmed/16131294

Daryl Bem[11], psychologist and professor at the Cornell University, describes nine well-established experiments in psychology conducted in the retrocausal mode in order to get the effects before rather than after the stimuli. For example, in a priming experiment, the subject is asked to judge whether the image is positive (pleasant) or negative (unpleasant) by pressing a button as quickly as possible. The reaction time is recorded. Just before the positive or negative image, a *prime* is presented briefly, below the perceptual

[11] Bem, D., *Feeling the future: Experimental evidence for anomalous retroactive influences on cognition and affect*, Journal of Personality and Social Psychology, 2011, 100(3): 407– 425, DOI: 10.1037/a0021524, https://pdfs.semanticscholar.org/79ec/e4f787af713d82924e41d8c17ab130f4b22d.pdf

threshold so that it is not perceivable at a conscious level. It has been observed that subjects tend to respond more quickly when the prime is congruent with the following image, whether it is a positive or a negative image, while the reactions become slower when they are not congruent, for example when the prime is positive while the image is negative.

In retro-priming experiments, the prime is shown after, rather than before the subject responds, based on the hypothesis that this "inverse" procedure can retrocausally influence the reaction time. The experiments were conducted on more than a thousand subjects and showed retrocausal effects with statistical

significance of $p<1.34x10^{11}$, a possibility on 134,000,000,000 of being mistaken when affirming the existence of the retrocausal effect.

Syntropy explains these results in the following way:

"*Since life nourishes on syntropy, and syntropy flows backwards-in-time, the parameters of the autonomic nervous system that supports vital functions must react in advance to future stimuli.*"

This general hypothesis was translated in the following working hypothesis: "*Heart rate and skin conductance should react in advance to future stimuli.*"

EXPERIMENTS

Before starting the experiments, in late 2007, an assessment of heart rate and skin conductance measuring devices was carried out. One requirement was to associate the measurements with the time of the clock of the computer. The problems were the following:

- Measuring devices used a different clock from the one used by the computer.

- Data did not consider the time required to produce the measurements.
- Built-in software did not satisfy the synchronization of measurements with the stimuli presented on the PC monitor.
- Proprietary software did not allow to directly access the device.

To try to overcome these difficulties, a laboratory in North Italy provided some devices, but still it was impossible to establish a satisfactory synchronization between the measurements and the stimuli which were presented on the PC monitor.

In December 2007 the assessment was extended to devices used in the field of sports training. Most devices showed the following limits:

- Heart rate measurements were stored in a wristwatch, using a different clock from the one used by the PC.
- The information was stored without any compensation for the delay due to the measurement.
- Some devices showed errors in the measurements.

After a long evaluation, the "home training" device produced by SUUNTO was chosen. This system

included a thorax belt for measuring heart rate parameters and a USB interface (PC-POD) which received data by radio signals (using digital formats which eliminated any possibility of interference) directly on the PC on which the experiment was carried out and using in this way the same clock of the PC.

The SUUNTO heart rate monitor device saved the heart frequency information every second, together with PC clock information (year, month, day, hour, minute and second). Data was saved compensating the delay due to the time necessary to perform the measurement and to process the information. The heart rate data could

therefore be synchronized with the data saved by the PC software used in the presentation of stimuli.

The heart rate information was saved as an integer number, without any decimal values. The technical support unit of SUUNTO was contacted in Helsinki and gave full cooperation sending all the necessary documentation, software and ddl libraries. SUUNTO underlined that synchronization and precision of measurements are diverging parameters. Synchronization reduces the precision of the measurements. An integer value of the heart rate, provided every second, can be considered an excellent measurement.

The SUUNTO “home training” device was developed to monitor sports training activities and can be used in the most extreme conditions, for example underwater. It does not require the use of gel to receive the heart signals and it is extremely simple to use. It does not require the presence of an assistant in the same room in which the experiment is carried out. The only limit was observed in cold weathers when the skin gets dry, and this limits the possibility to measure the heart rate parameters.

Experimental trial

Several experimental designs were tested, and a design divided in 3 phases was chosen:

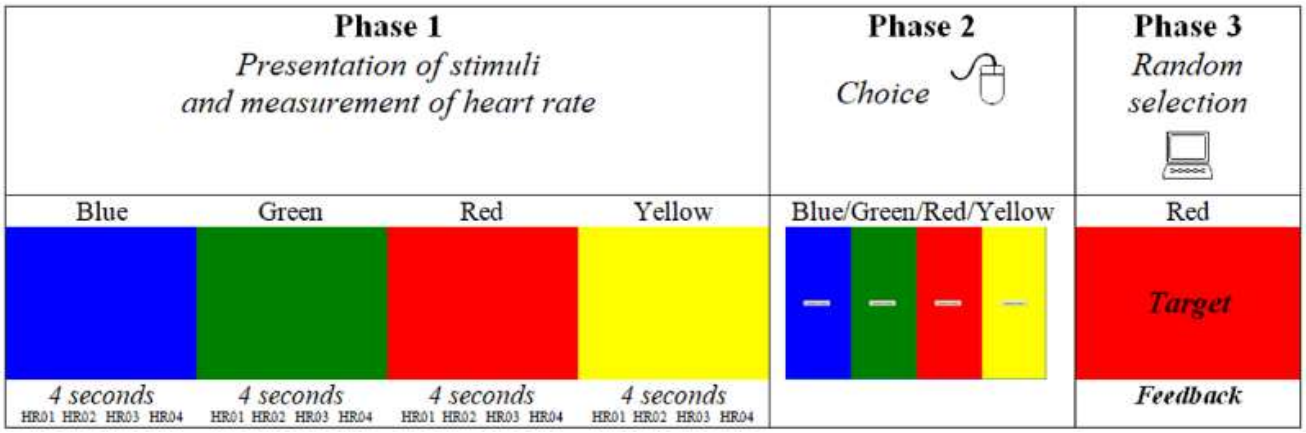
- In the presentation phase: 4 stimuli were shown individually on the PC monitor and the heart rate was measured.
- In the choice phase: stimuli were shown together on the PC monitor and the subject had to guess which one the computer would select.
- In the random selection phase, the computer selected one of the 4 stimuli (target stimulus), using a

random procedure, and showed it on the PC monitor, full screen.

The initial hypothesis was that in the event of retrocausality heart rate measurements in phase 1 (the presentation phase) would be significantly different among target images (those which will be selected randomly by the computer in phase three).

The first tentative experiments used stimuli made of black bars placed horizontally, vertically and diagonally on a white background. Data analyses did not show any significant difference among heart rates measured in phase one.

The hypothesis was therefore analyzed more in depth, and it was found that the "syntropy theory" posits that retrocausality is mediated by feelings and, therefore, to assess differences in heart rates measured in phase 1, stimuli in phase 3 should arise feelings. Following this indication, it was decided to use 4 elementary colors: blue, green, red, and yellow. Using colors, a strong difference in heart rate frequencies in phase 1 was observed in correlation to the target shown in phase 3.



The experimental trial was the following:

- *Phase 1*, in which 4 colors were displayed one after the other on the computer screen and the heart rate was measured.
- *Phase 2*, in which an image with 4 colored bars was displayed and the subject had to try to guess the color that the computer would have selected.
- *Phase 3*, in which the computer randomly selected the target color and showed it full screen.

This experimental trial was repeated 100 times for each subject.

Hypothesis

The hypothesis was that in the case of a retrocausal effect, differences should be observed among the heart rates measured in phase 1 in correlation with the target color selected in phase 3 by the computer.

Random Events Generator

To test retrocausal effects it is necessary to use Random Event Generators.

In a random sequence each term is totally independent from the previous and following terms, no rule links different parts of the sequence. This condition is known as unpredictability of random sequences, and it is referred to as "lack of memory": the process of random selection does not recall any information about the values which were selected previously and cannot be used for the prediction of the values which will be selected in the future.

Random sequences imply:

– *Unpredictability*. The knowledge of any portion of the random

sequence does not provide useful information to predict the outcome of any other element of the sequence. In other words, the knowledge of the first k values does not provide any element to predict the value k+1: this property is called unpredictability.

– *Equiprobability*. A sequence is random if in each position each value has the same probability to be selected. In the case of a dice, each side has the same probability to be selected. Similarly, equal probability is expected when using a coin: during each tossing heads and tails have the same probability to show. Equiprobability implies

independent sequences as it requires that the outcome of each selection is independent from any previous selection.

- *Irregularity*. Unpredictability requires random sequences to be irregular and not repetitive.
- *Absence of order*. In random sequences no type of structure or order can be detected.

The basic difference between causal and random can be traced back to the fact that causal events can be predicted, whereas random events cannot be predicted. A random sequence can be defined as a sequence

that no cognitive process will ever be able to predict.

Pseudorandom and random

Computer languages usually use the word *random* to identify the instruction which starts the algorithm for the random selection of numbers. In the experiments described in this paper the Delphi Pascal programming language was used. Delphi-Pascal has a predefined random sequence of 2^{32} numbers, which can be assessed through a pointer which can be defined by the user or by the value of the built-in clock. Delphi-Pascal uses the following instructions:

– *Randomize* reads the value of the built-in clock and uses this value as the pointer to the predefined random sequence.
– *Random* reads the value of the predefined sequence using the pointer selected by the randomize instruction.

The user can also define a personalized pointer. This option is generally used to encrypt information. Using the same pointer, the random sequence will always be the same.

Random sequences produced by computers are named *pseudorandom* since loops always require the same

processing time, and the new random value will therefore be determined by the previous one. The problem with random sequences generated by computers arises when the randomize procedure is recalled in a loop, since random numbers will be determined by the first value which was selected: the first value determines the second one, and so on, and the condition of independency between different terms is lost.

Usually, the fact that computers produce pseudorandom sequences is considered insignificant. However, in experiments which want to test retrocausality, and which assume unpredictability, a pseudo-random

sequence would inevitably be an artifact.

Luckily the solution is relatively simple. The problem arises from the fact that the period of the loops is always the same. To overcome this problem, obtaining in this way pure random sequences, it is necessary to use loops which are based on unpredictable periods of time. This condition can be easily met when an external, unpredictable factor, is inserted in the loop and modifies its execution time.

In the experiments described in this paper subjects were asked to guess in phase 2 the color that the computer will select, pressing a button: the reaction time of the subject is

unpredictable. In this way, the unpredictable reaction time of the subject makes loops time become unpredictable, and the value read from the built-in clock of the computer becomes independent from the other values, the independence is restored, and the sequence becomes totally unpredictable: perfectly random.

Data Analysis

In this chapter only the fourth experiment will be discussed. A complete review of the experiments is available in: "*Retrocausality: experiments*

and theory"[12] and "*A syntropic model of consciousness*"[13].

Since each subject completed 100 trials, data analysis could be performed for each single subject and results generally were strong from a quantitative and statistical point of view and showed the retrocausal effects in phase 1 associated to all the target colors (the colors chosen by the computer in phase 3).

However, this effect could go in different directions. In some subjects when red was the target color the heart rate increased in phase 1,

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[12] Vannini, A. and Di Corpo, U., *Retrocausality: experiments and theory*, ISBN: 9781520275956,www.amazon.com/dp/1520275951

[13] Vannini, A., *A syntropic model of consciousness*, ISBN: 9781520834412, https://www.amazon.com/dp/1520834411

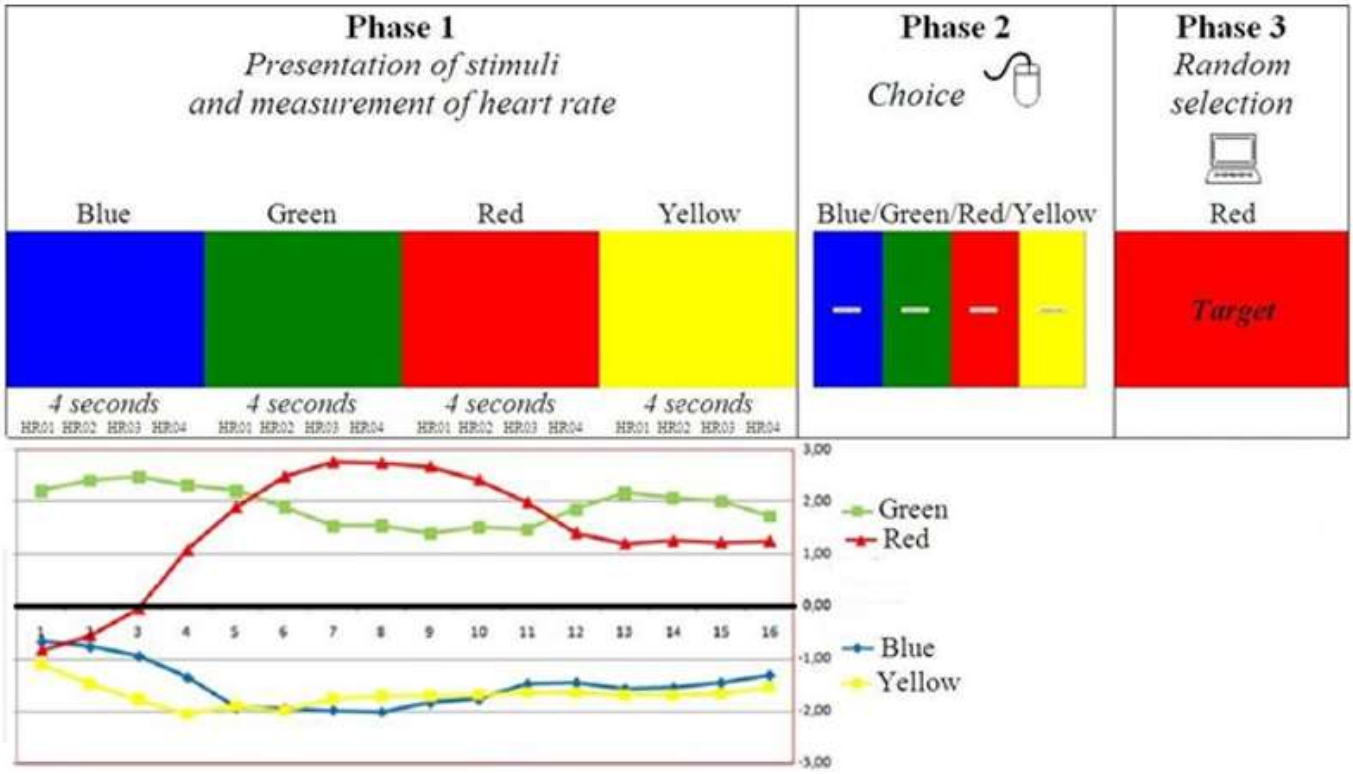
whereas in other subjects it decreased. Considering all the subjects together, these opposite effects were cancelling each other reducing the general effect or showing it only on some colors. For this reason, we started using for each subject "feed-back" tables where each line is relative to one of the 16 heart rates measurements in phase 1. Since for each heart rate (HR) we have 100 values (100 trials), the difference between the mean value when the color was target and not target could be calculated.

	Blue	Green	Red	Yellow
HR 1:	-0.671	2.200	-0.840	-1.103
HR 2:	-0.772	2.399	-0.556	-1.471

HR 3:	-0.950	2.467	-0.056	-1.766
HR 4:	-1.353	2.310	1.080	-2.054
HR 5:	-1.928	2.204	1.894	-1.892
HR 6:	-1.954	1.897	2.474	-1.993
HR 7:	-1.982	1.535	2.752	-1.755
HR 8:	-2.015	1.543	2.733	-1.704
HR 9:	-1.831	1.397	2.665	-1.704
HR 10:	-1.770	1.508	2.407	-1.691
HR 11:	-1.482	1.468	1.981	-1.641
HR 12:	-1.458	1.853	1.404	-1.637
HR 13:	-1.572	2.154	1.199	-1.679
HR 14:	-1.544	2.079	1.260	-1.676
HR 15:	-1.452	1.994	1.226	-1.661
HR 16:	-1.311	1.727	1.255	-1.541

Feed-back table of the retrocausal effect for one subject.

The feed-back table was then graphically represented.



Graphical representation of the feed-back table

When the retrocausal effect is missing, the differences of the mean values of the heart rate tend to zero and the lines vary around the baseline (the 0.00 line), whereas the stronger the effect is and the more the lines separate from the baseline.

Using for each subject this graphical representation we discovered that it was necessary to use computer

monitors with brilliant colors, it was necessary to conduct the experiment in calm and silent environments leaving the subject alone (except for the first trial which was considered a training trial, and the experimenter was in the room to check if the subject had understood the instructions). Another important consideration was that the attention of the subject had to be on the last two phases; in fact, if little attention was given to the first phase, the effect was still showing. The effect spread all over phase 1 and was not associated only to the color in phase 1 that matches the target color.

Feed-back tables became the row-data for the analyses, which were

conducted using non-parametric statistics such as Chi-Square and Fisher's exact test.

Anticipatory learning effect

While performing the first three experiments we came across Antonio Damasio[14] and Antoine Bechara's[15] works and experiments on anticipatory reactions. Studying neurological patients affected by decision-making deficits, Damasio discovered that feelings play an

[14] Damasio, A.R., *Descarte's Error. Emotion, Reason, and the Human Brain*, Putnam Publishing, 1994: https://www.amazon.it/dp/B00AFY2XVK

[15] Bechara, A., Damasio, H., Tranel, D. and Damasio, A.R., *Deciding Advantageously before Knowing the Advantageous Strategy*, Science, 1997 (275): 1293: www.labsi.org/cognitive/Becharaetal1997.pdf

important role allowing to operate advantageous choices, without having to produce advantageous assessments, and that decision-making deficits are always accompanied by alterations in the ability to feel. Damasio noticed that the absence of feelings leads to the inability to "*feel the future*" and choose advantageously and suggested that goal-oriented systems, moved by finalities, are based on feelings. These systems use body signals coming from the autonomic nervous system: heart, lungs, and intestine. Classical measurements of the autonomic nervous system parameters are heart rate frequency, skin conductance and body temperature.

Bechara, a student following a specialization course in Damasio's laboratory, devised a guessing task to test Damasio's hypothesis[16]. In the experiment the subject is seated in front of a table on which 4 decks of cards are placed, each marked with a different letter: A, B, C and D. Subjects receive 2,000 dollars (false, but perfectly resembling true money) and are told that the aim of the game is to lose the least and try to win as much as possible. The game consists in uncovering cards, one at a time, from any of the decks, until the experimenter stops the game. Each

[16] Bechara, A., Damasio, H., Tranel, D. and Damasio, A.R., *The Iowa Gambling Task and the somatic marker hypothesis: some questions and answers*, Trends in Cognitive Sciences, 9: 4, April 2005, web.stanford.edu/~jlmcc/papers/BecharaEtAl05_TiCS.pdf

card is associated with a gain or a loss of money. Only when a card is turned it is possible to know how much the subject has earned or lost. Subjects start testing each of the decks, searching for clues and regularities. Decks A and B give high gains, but lead to higher losses, while decks C and D give lower gains, but lead to a slow gain of money. Players gradually develop the knowledge that decks A and B are more dangerous.

Both normal subjects and patients produce skin conductance reactions each time they receive a gain or a loss after they turn a card.

However, in normal subjects, after they have turned a certain number of cards, something different happens.

Just before they choose a card from a dangerous deck (A or B) a skin conductance response is observed which increases while the game progresses. Damasio interpreted this as a learning effect. The subject gradually learns the possible negative outcome of each deck, and before a card is chosen the autonomic nervous system informs the subject through the activation of feelings, which in this case were measured using skin conductance.

Patients with decision-making deficit do not show this anticipatory arousal of skin conductance and chose disastrously.

Learning versus retrocausal

The experimental design of the fourth experiment was therefore changed, to allow to distinguish anticipatory effects due to learning from anticipatory effects due to retrocausality:

– Differences in heart rate frequencies observed in phase 1, in association with the unpredictable random selection of the target operated by the computer in phase 3 were attributed to a retrocausal effect, since future selections of the target are unpredictable.

– Differences in heart rate frequencies observed in phase 1, in association with the choice operated by the subject in phase 2, were interpreted as learning effect.

To allow for a learning effect, the fourth experiment used different probabilities in the selection of target colors. In the third phase one color had a 35% chance of being selected (lucky color), one had a 15% chance (unlucky color), and the last two colors had a 25% chance (neutral colors).

The task given to the subjects was to guess the highest number of target colors. Subjects were not informed

that colors had a different probability of being selected and the experimenter did not know which were the lucky, unlucky, and neutral colors.

Results

The feed-back tables on the differences between mean values of the heart rate (HR) when the color is target and non-target provided the row data for the statistical analyses of the retrocausal effect. The sample was of 30 subjects. Feed-back tables were divided into 3 groups: first 33 trials (starting from the second trial), central 33 trials and the last 33 trials.

For the retrocausal effect the mean values differences were therefore 5760 (30 subject x 16 heart rates x 4 colors x 3 groups of feed-back tables). Using this dataset and a threshold of 1.5, the following distribution was obtained:

Frequencies	**Differences of the mean values**			Total
	Up to -1.5	**-1.5 +1.5**	**+1.5**	
Observed	1,053 (17.83%)	3,680 (63.89%)	1,027 (18.28%)	5,760 (100%)

Distribution of mean HR differences in feed-back tables of the retrocausal effect

To assess the effect, we needed a term of comparison which the Chi Square names *expected frequencies* in the absence of an effect. To calculate this distribution a "Non-Correlated Target" (NCT) was used, a sequence which in the first trial was blue, then

green, then red, then yellow and went on repeating regularly until the 100th trial. This sequence was non-correlated with the random sequence of targets which was selected by the computer and shown to the experimental subject. It was therefore used to calculate the expected frequencies. The following table was obtained:

Frequencies	**Differences of the mean values**			Total
	Up to -1.5	**-1.5 +1.5**	**+1.5**	
Observed	1,053 (17.83%)	3,680 (63.89%)	1,027 (18.28%)	5,760 (100%)
Expected (N.C.T.)	781 (13.56%)	4,225 (73.35%)	754 (13.09%)	5,760 (100%)

Distribution of mean HR differences in feed-back tables of the retrocausal effect, for observed and expected frequencies

The Chi Square value for this table is 263.86 which is by far more than

13.81 which (with 2 df, i.e. two degrees of freedom) corresponds to $p<0.001$. In this example it was not possible to use the exact test of Fisher since this test requires 2x2 tables.

The same procedure was used for the learning effect. The mean values differences were 4320 (30 subject x 16 heart rates x 3 types of colors x 3 groups of feed-back tables). Using this dataset and a threshold of 1.5 the following distribution was obtained:

Differences	Color chosen by the subject			Total	N.C.T.
	Neutral	Lucky	Unlucky		
From + 1.5	14.0%	16.6%	17.2%	16.0%	13.1%
-1.49 to +1.49	73.5%	66.0%	66.0%	68.5%	73.3%
Up to -1.5	12.5%	17.4%	16.8%	15.5%	13.6%
	100% (n=1,440)	100% (n=1,440)	100% (n=1,440)	100% (n=4,320)	100.0%

Distribution of mean HR differences in feed-back tables of the leaning effect

We see that before the choice of neutral colors, observed and expected frequencies coincide (73.5% compared to 73.3 expected according to NCT), whereas for the lucky and unlucky colors it is possible to observe a difference between observed and expected frequencies which is associated with a Chi Square value of 39.15 ($p<1/10^9$), which shows the existence of a learning effect.

According to Damasio during the experiment the subject learns the different probabilities, and this shows in the form of a stronger activation of the learning effect.

Differences (*Absolute values*)	Trials			Total	N.C.T.
	2-34	35-67	68-100		
Below 1.5	69.4%	73.8%	62.3%	68.5%	73.3%
From 1.5	30.6%	26.2%	37.7%	31.5%	26.7%
	100% (n=1,440)	100% (n=1,440)	100% (n=1,440)	100% (n=4,320)	100.0%

Learning effect. Distribution of mean differences of HR measured in phase 1 according to the choice operated by the subject in phase 2, divided for groups of trials.

The computer selects which are the lucky, unlucky, and neutral colors at the beginning of the experiment, using a random procedure. No one during the experiment knew which were the lucky and unlucky colors, only at the end of the experiment this information was saved in the data file and could be known. The hypothesis was that the effect should increase while the experiment progresses and that it would be particularly strong in the last trials.

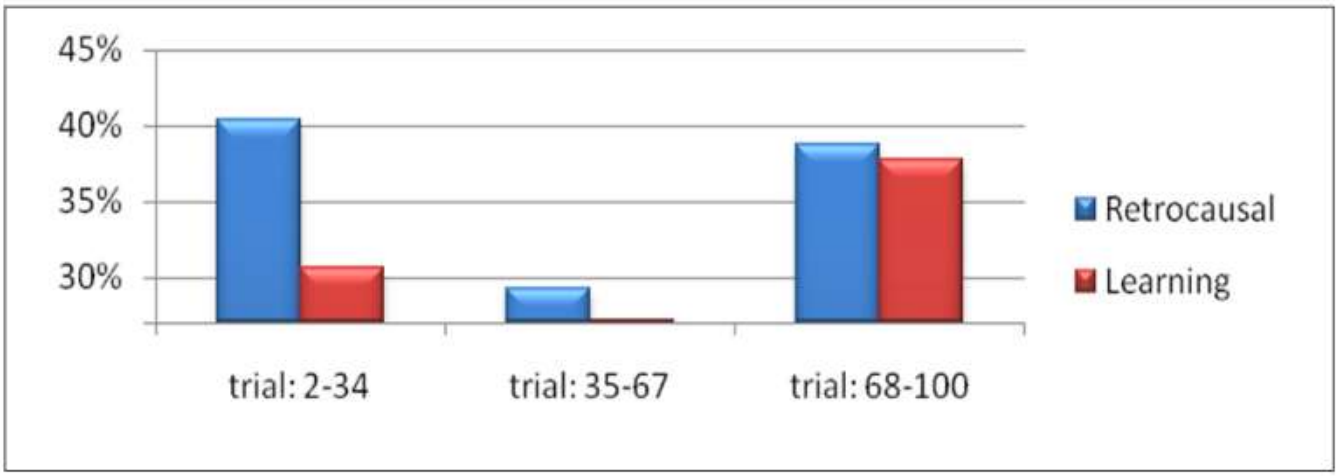
However, the table shows in the first 33 trials a slight learning effect with a Chi Square value of 11,53, just over 1/1000 of statistical significance. In the middle 33 trials no learning effect is observed. In the last 33 trials the learning effect is strong with a Chi Square of 89,77 which corresponds to $p<1/10^{22}$. These results show a learning effect that is not gradual in its increase, as expected by Damasio.

In the retrocausal distribution of the effect we see a strong effect in the first 33 trials, which drops in the middle trials and then increases again in the last trials.

Differences (*Absolute values*)	Trials			Total	N.C.T
	2-34	35-67	68-100		
Below 1.5	59.6%	70.8%	61.2%	63.9%	73.3%
From 1.5	40.4%	29.2%	38.8%	36.1%	26.7%
	100% (n=1,920)	100% (n=1,920)	100% (n=1,920)	100% (n=5,760)	100.0%

Retrocausal effect. Distribution of mean differences of HR measured in phase 1 according to the selection operated by the computer in phase 3, divided for group of trials.

If we graphically compare the leaning and retrocausal effect, we have the following graph:



The retrocausal effect is strong starting from the first 33 trials, while

the learning effect is just slightly significant. Then, in the middle trials the learning and retrocausal effects drop and disappear. At the end of the experiment, in the last 33 trials, both the effects become strong.

This trend suggests that when the learning effect starts emerging it conflicts with the retrocausal effect, since they both use similar signals coming from the autonomic nervous system, and consequently they both drop. In the last part of the experiment the subject becomes capable of distinguishing between these two similar signals, and thus both the effects emerge again and show strongly.

It was interesting to note that whilst strong learning and retrocausal effects are observed especially in the last 33 trials, this does not translate into more advantageous guesses and subjects continued to guess randomly.

The results have been here described in a non-technical way. A more detailed analysis is available in the books "*Retrocausality: experiments and theory*", "*A syntropic model of consciousness*" and in "*The methodology of concomitant variations*"[17] which provides the access to the sintropia.ds software which among its tutorials provides the whole original dataset of this experiment.

[17] Di Corpo, U. and Vannini, A., *The methodology of concomitant variations,* ISBN: 9781520326634, https://www.amazon.com/dp/1520326637

Comments

In the last ten years from the end of these experiments we have seen a slow change in attitude towards retrocausality, which is now more accepted in many fields of science.

Up till now entropy seemed to be the only manifestation of reality which was lacking its dual. All the manifestations of reality seem to be dual: absorbers and emitters, causality and retrocausality, particles and waves. Retrocausality implies the dual to entropy: syntropy. In our opinion, the difficulty lies in the fact that the extension of science to retrocausality and syntropy implies a paradigm shift.

However, a growing number of scientists believe that without the dual to entropy, life will remain a mystery.

The evolutionary paleontologist Teilhard de Chardin wrote:

"*Reduced to its essence the problem of life can be expressed like this: accepting the two principles of conservation of energy and entropy, how can they assimilate without contradiction, a third universal law (which is expressed by biology), that of the organization of energy? ... the situation becomes clear when we consider, at the basis of cosmology, the existence of a sort of anti-entropy … In other words, not just one kind of energy, but two different energies; two energies which cannot transform directly one*

into the other, because they operate at different levels ... The behavior of these two energies is so completely different and their manifestations so completely irreducible that we might believe they belong to two completely independent ways of explaining the world. And yet, as the one and the other, are in the same universe, and evolve at the same time, there must be a secret relationship."[18]

Similarly, Albert Szent-Gyorgyi, Nobel Prize for physiology in 1937 and discoverer of the vitamin C, wrote:

"*It is impossible to explain the qualities of organization and order of living systems*

[18] Teilhard de Chardin, P., *The Phenomenon of Man*, www.amazon.it/dp/0061632651

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 ... One of the main differences between the amoebas and humans is the increase in complexity which presupposes 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 counteract the universal tendency of matter towards chaos and energy towards heat death. Life continuously shows a decrease in entropy and an increase in its internal complexity and often in the complexity of the environment, in direct opposition to the law of entropy ... We observe a profound difference between the organic and inorganic systems ... as a man of

science I cannot believe that the laws of physics lose their validity as soon as we enter the living systems. The law of entropy does not govern living systems."[19]

The mathematician Chris King[20] starting from the energy-momentum-mass equation speculates that free will arises from the fact that we are faced with bifurcations between information arriving from the past (entropy), and in-formation arriving from the future (syntropy). These bifurcations entail choices and

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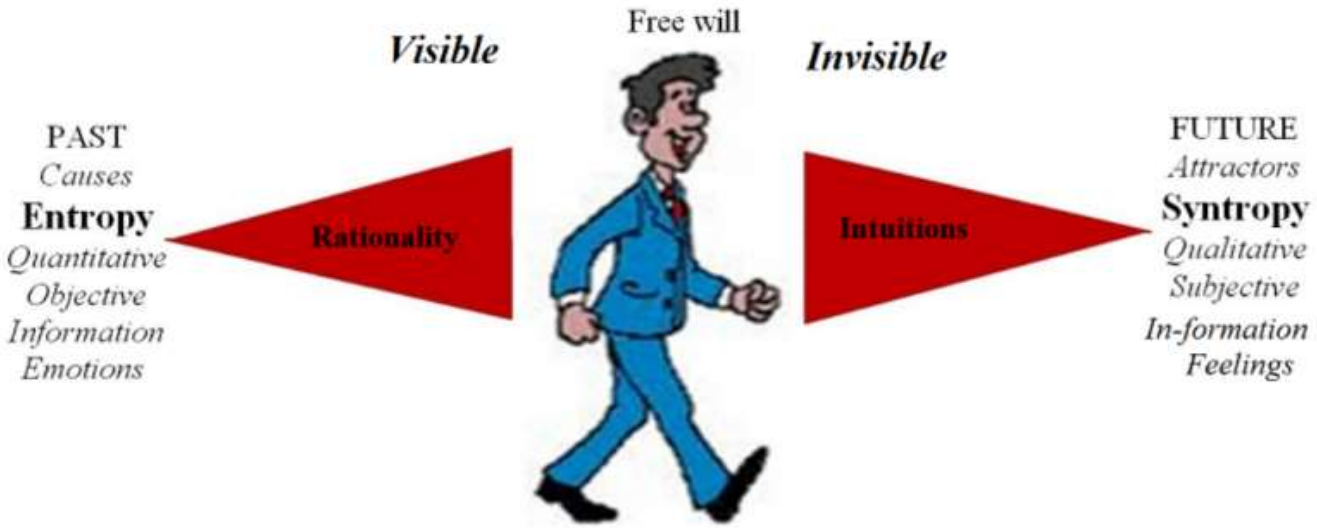
[19] Szent-Gyorgyi, A., *Drive in Living Matter to Perfect Itself*, Synthesis 1977, 1(1): 14-26.

[20] King, C.C., *Dual-Time Supercausality*, Physics Essays, 1989, 2(2): 128-151, DOI: 10.4006/1.3035859: https://www.researchgate.net/publication/243587225_Dual-Time_Supercausality

choosing puts us in a condition of free will:



Supercausal model of consciousness and free-will.

The terms microevolution and macroevolution were introduced in 1927 by Philiptschenko[21], where:

– *Microevolution* indicates the selection of features within the same species, for example: quantitative changes

[21] Philiptschenko, J., *Variabilitat und Variation*, 1927, Berlin, www.amazon.it/dp/B005TTH1I6

of organs and structures of existing bodies.

– *Macroevolution* indicates the evolution of new features, for example: the development of organs, structures, and forms of organization with qualitatively new genetic material.

It is generally accepted that Darwin's mechanism of natural selection and genetic drift operate only within the context of microevolution. Introducing syntropy and retrocausality macroevolution can be seen as guided by attractors, that receive the experiences of all the individuals and select only what is

advantageous for life, producing in this way qualitatively new materials.

In this perspective life would not be the product of chance, but it would be finalized and guided. This can solve paradoxes such as the fact that proteins involved in the metabolism of cells are composed of chains which include more than 90 amino acids, and combinatory calculations show that more than 10^{600} (one followed by 600 zeroes) permutations are required to combine amino acids by chance in a "spontaneous" protein of 90 amino acids. This number is by far greater than the limit which was calculated by Elsasser[22] in a maximum of 10^{106}.

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[22] Elsasser W.M., *A causal phenomena in physics and biology: A case for reconstruction*. American Scientist, 1969, 57: 502-16: https://www.jstor.org/stable/27828741

The experiments presented in this paper suggest that syntropy acts through the autonomic nervous system. Since it is converging energy, it is felt as warmth associated to wellbeing due to the nourishing of the vital functions. On the contrary, the lack of syntropy would be felt as void associated to suffering. These feelings of warmth and wellbeing work as the needle of a compass that points to what is beneficial for our future, whereas feelings of void and distress tell that we are on a wrong path or a dangerous territory. Learning to recognize and use these feelings can be of great help. Henri Poincaré noticed that these feelings are associated to the process of

intuition[23]. When faced with a new mathematical problem, he began using the rational approach that allows to become aware of the characteristics and elements of the problem. However, since the options tend to be infinite and it would take infinite time to evaluate them all, some other type of process starts operating leading to select the correct solution. When the solution is found, it is signaled by an "emotion of truth", an aesthetic feeling all the inventors and creators are familiar with. An example was offered by Steve Jobs, the founder of Apple Computer. He discovered that in the Indian

[23] Poincaré, H., *Mathematical Creation*, from Science et méthode, 1908, vigeland.caltech.edu/ist4/lectures/Poincare%20Reflections.pdf

countryside people do not let themselves be guided by rationality, as we do, but by intuitions, and intuitions are more powerful than the intellect. His achievements can be explained because of its intuitive abilities, a gift difficult to harmonize with the rational side. Einstein used to say that: "*the intuitive mind is a sacred gift and the rational mind is its faithful servant. But we have created a society that honors the servant and has forgotten the gift.*"

Interesting applications are provided by syntropic farming[24] and syntropic agriculture[25] which started from the intuitive abilities of Ernst Gotsch, who showed that he was able

[24] https://www.syntropicfarms.com/
[25] https://lifeinsyntropy.org/en/

to transform arid lands in flourishing agroforestry realities in a matter of just a few years. The limit of this approach is the fact that intuition is not that easy to teach and transfer.

DYNAMIC BALANCE BETWEEN ENTROPY AND SYNTROPY

The first law of thermodynamics states that energy is a unity that cannot be created or destroyed, but only transformed.

Entropy and syntropy are the two forces that constantly transform this unity, in a dynamic process of energy transformation. This dynamic interaction pervades all aspects of the universe producing vibrations.

In 1665, the Dutch mathematician and physicist Christian Huygens,

among the first to postulate the wave theory of light, observed that, putting side by side two pendulums, these tended to tune their oscillation as if "*they wanted to take the same rhythm*." 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.

All the manifestations of the universe are a continuous vibration between polarities: converging and diverging, syntropy and entropy, absorbers and emitters.

In life, this takes the form of waves, pulsations and rhythms: the pulsations of the heart, the phases of the breath, light and sound waves.

All aspects of reality vibrate, and these vibrations create resonances. An example is provided by tuning forks that vibrate at a frequency of 440 Hz. When a vibrating tuning fork is placed near a "*silent*" tuning fork, this second tuning fork begins to vibrate. Tuning forks vibrate only when exposed to a sound with their own resonance.

Resonance is the principle used by radios to tune to a specific station. Tuning to a frequency allows to receive only the information sent with that frequency, all other information is not accessible.

The same happens with life. We only perceive what vibrates at our own frequency. This resonance process

allows information to flow. Person, events, and situations are associated with a specific vibration. We communicate easily with people who have the same vibration as ours, while communication is more difficult with others.

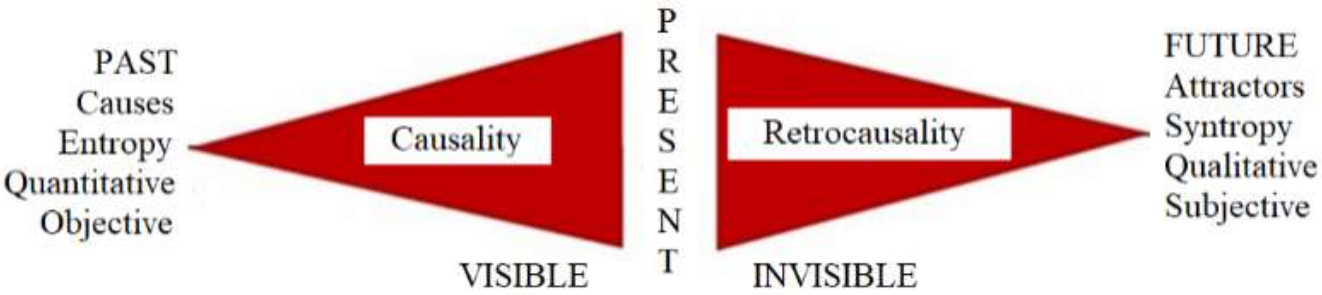
Individuals who resonate in the same way can easily establish lasting bonds. For example, young people who have had problems with abandonment, violence and abuse in their families tend to attract without knowing each other's history.

Resonance leads people to recognize themselves and to share feelings and information. This empathic communication often takes place at an unconscious level.

We constantly experience resonance. We can talk to more people on the same subject, using the same words, the same gestures, and the same emphasis, and with some we feel that communication is full, while with others we feel that communication is empty.

Resonance allows to communicate at a deeper level. When we resonate, we feel that communication is intense and profound.

Everything is a vibration between the past and the future. The energy-momentum-mass equation describes the present as the interaction of causes that act from the past (causality) and attractors that act from the future (retrocausality).



Supercausal representation of the present

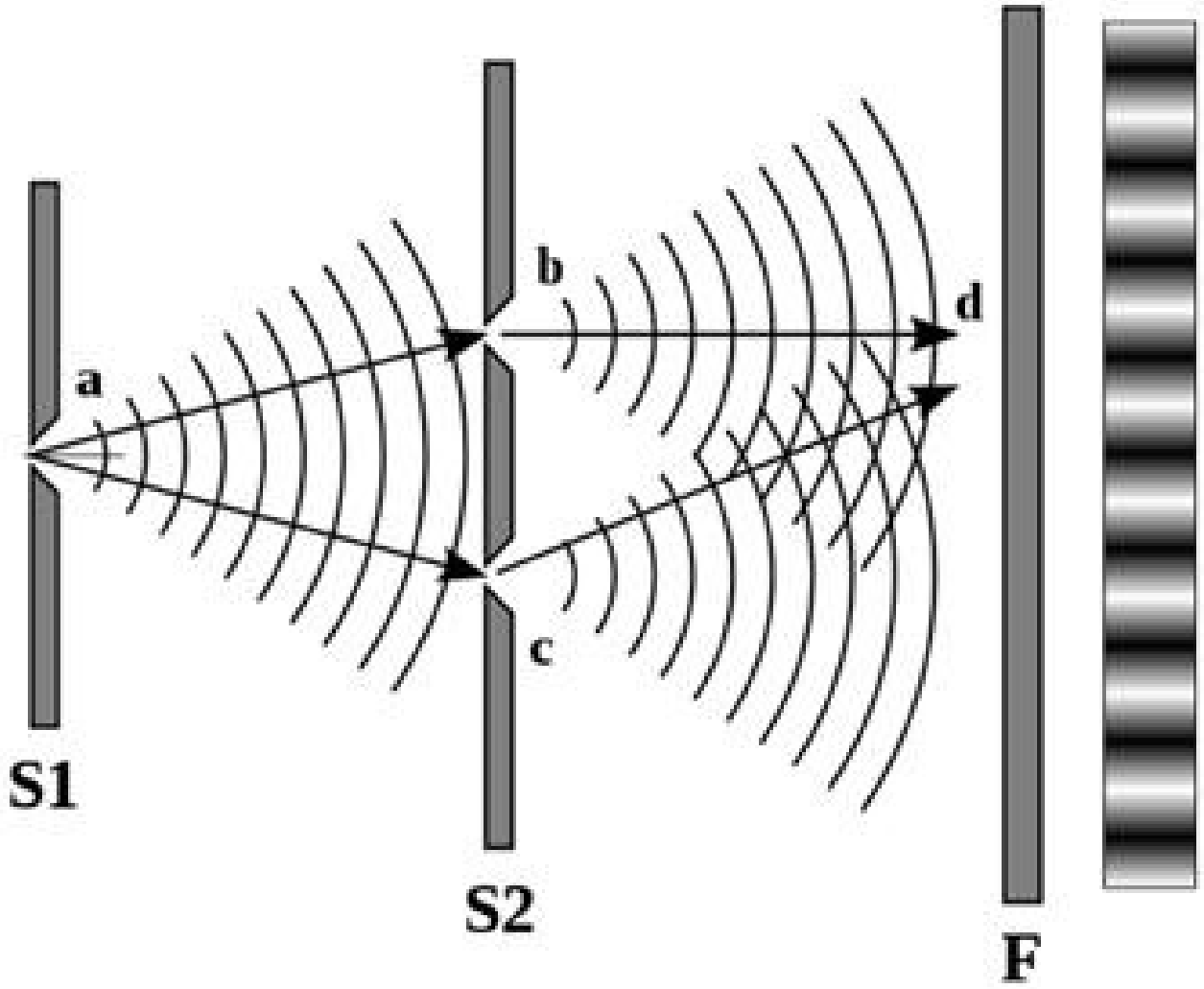
Causes are quantitative and objective and their effects are regulated by the law of entropy. Instead, attractors are usually perceived in a qualitative and subjective way. Their effects are governed by the law of syntropy.

On November 24, 1803, Thomas Young demonstrated that light propagates as waves:

"The experiment I'm about to talk can be repeated with great ease, as long as the Sun

is shining and with an instrument within everyone's reach."

Young's experiment is very simple. A sunray passes through the slit of a screen (S1), then reaches a second screen (S2) with two slits.



Thomas Young's double-slit experiment

The light that passes through the two slits of the second screen finally ends up on the white screen F, where it creates a figure of lights and shadows. If the light were made of particles, two points of light should be observed at the height of the two slits. Instead, we observe a figure in which dark bands and light bands alternate.

Young explained this result as a demonstration of the fact that light propagates through the two slits as waves. These waves give rise to luminous bands at the points where they add up, that is, where there is constructive interference, while they give rise to dark bands where they do not add up, where there is destructive

interference.

Everything went well until the end of the nineteenth century, when physicists faced a paradox. Maxwell's equations led to predicting that a black body, an object that absorbs electromagnetic radiations, must emit ultraviolet frequencies with infinite power peaks. Fortunately, this did not happen! This prediction, known as the ultraviolet catastrophe, has never been observed.

The answer was provided by Max Planck on December 14, 1900. In an article that he presented to the German Physics Society, Planck suggested that energy does not propagate in the form of waves, but as multiples of fundamental units,

which he called quanta. A quanta can be more or less small depending on the frequency of vibration of the atom. Under the size of the quanta energy does not propagate. This avoids the formation of infinite peaks and solves the paradox of the ultraviolet catastrophe.

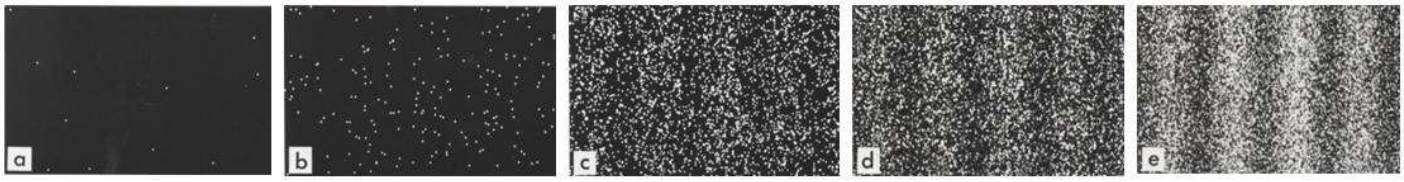
In 1905 Einstein explained the behavior of the photoelectric effect considering light made of quanta rather than waves. The photoelectric effect is that when light rays strike a metal, the metal emits electrons. However, up to a certain threshold the metal does not emit electrons and above this threshold it emits electrons whose energy remains constant. The

wave theory of light cannot explain this behavior.

Einstein suggested that light, previously considered only as an electromagnetic wave, could be described in terms of quanta, particles we now call photons. The explanation provided by Einstein treats light in terms of particle beams, rather than in terms of waves, and has paved the way for the wave-particle duality.

Today, the exact equivalent of Young's experiment can be conducted using an electron beam. The electrons launched in a double-slit experiment produce an interference pattern on the detector screen and must therefore propagate as waves. However, upon arrival, they

generate a point of light, behaving like particles.



If the electrons were particles, they would go through one or the other of the two slits; however, the interference shows that they behave like waves that go through the two slits simultaneously.

According to Richard Feynman the central mystery of quantum mechanics is hidden in the double-slit experiment:

"*It is a phenomenon in which it is impossible, absolutely impossible, to find a*

classical explanation, and which represents well the nucleus of quantum mechanics. It contains the only mystery (...) The fundamental peculiarities of all quantum mechanics." [26]

The wave-particle duality shows how supercausality works, the constant interaction of causality and retrocausality where nothing happens without the contribution of both. The past manifests itself as particles (causality), while the future as waves (retrocausality). An emitter with particle properties and an absorber with wave properties are required for light to propagate.

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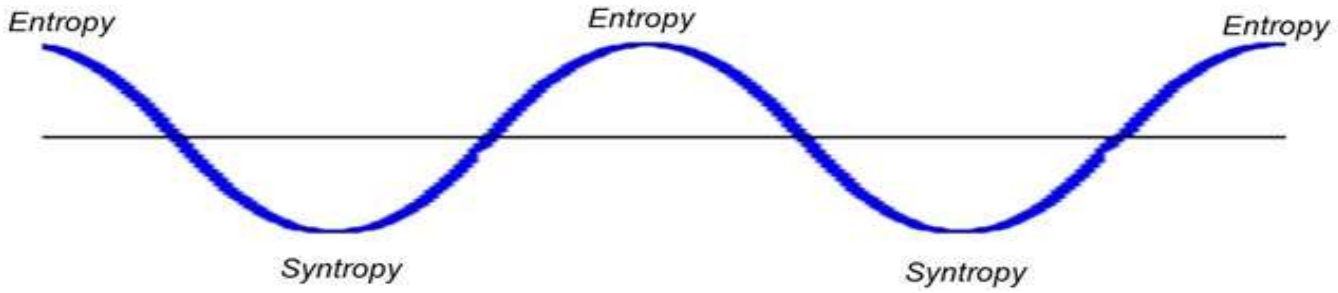
[26] Feynman, R., *The Feynman Lectures on Physics*, vol. 3 chapter 1: www.feynmanlectures.caltech.edu/III_01.html

Quantum mechanics tries to explain this duality by keeping the manifestations of waves and particles separate. For example, the Copenhagen interpretation says that the particle turns into a wave and then the wave collapses back into a particle. According to supercausality the dual nature wave-particle coexists, and it is inseparable, since all the manifestations of the universe are supercausal, the interaction between entropy and syntropy, between past and future, between emitters and absorbers.

The dynamic balance between entropy and syntropy presumes that any system vibrates between peaks of

expansion and contraction.



These cycles can be observed in any system and at any level, from the quantum level to the macro level and at the cosmological level where it supports Einstein's cosmological model of infinite cycles of Big Bang and Big Crunch.

The first formulation of the Big Bang theory dates to 1927 but was generally accepted only in 1964 when many scientists were convinced that observations confirmed that an event such as the Big Bang took place.

Georges Lemaître, a Belgian Catholic priest and physicist, developed the Big Bang equations and suggested that the increase in the distance of galaxies was due to the expansion of the universe.

He discovered a proportionality between distance and spectral displacement (now known as the Hubble law).

In 1929 Edwin Hubble and Milton Humason noted that the distance of galaxies is proportional to their redshift, the shift towards the lower frequencies of the light spectrum. This usually happens when the light source moves away from the observer or when the observer moves away from the source. The spectrum of the

light emitted by far away galaxies, quasars or supernovas, appears shifted to lower frequencies. Since red is the lowest frequency of the visible light, the phenomenon has received the name of redshift, even if it is used in connection with any frequency, including radio frequencies.

The redshift phenomenon indicates that galaxies are moving away from each other and, more generally, that the universe is in an expansion phase. Furthermore, red-shift measurements show that galaxies and star clusters move away from a common point in space and that the farther they are from this point, the greater their speed.

Since the distance between the

galaxy clusters is increasing, it is possible to deduce, going backwards in time, density and increasingly higher temperatures until reaching a point where values tend to infinity and the physical laws of positive time energy are no longer valid.

In cosmology, the Big Crunch is a hypothesis about the fate of the universe. This hypothesis is symmetrical to the Big Bang and claims that the universe will stop expanding and will begin to collapse on itself. Gravitational forces will prevent the universe from expanding to infinity and the universe will converge.

The contraction will appear very different from the expansion. While

the early universe was highly uniform, a shrinking universe will always be more diverse and complex. Eventually all the matter will collapse into black holes, which will then unite, creating a unified black hole, the singularity of the Big Crunch. The Big Crunch theory proposes that the universe can collapse in the state it started and then start another Big Bang. In this way the universe would last forever, going through an infinite sequence of expansion cycles (Big Bang) and contraction cycles (Big Crunch).

Recent observations, particularly that of distant supernovae, led to the idea that the expansion of the universe is not slowed down by

gravity, but rather it is accelerating.

In 1998, the measurement of light from distant stars led to the conclusion that the universe is expanding at an increasing rate. The observation of the red shift of supernovae suggests that they are moving away more quickly as the universe ages. According to these observations, the universe seems to expand at an increasing rate. This contradicts the Big Crunch hypothesis.

To explain these observations, physicists have introduced the idea of dark energy, of a dark fluid or phantom energy. The most important property of dark energy would be to exert a relatively homogeneously

distributed negative pressure in space, a kind of anti-gravitational force that is moving galaxies apart. This mysterious anti-gravitational force is considered a cosmological constant, which will lead the universe to expand exponentially. However, until today no one knows what dark energy is or where it comes from.

Conversely, supercausality suggests that the observed increase in the rate of expansion of the universe is not due to dark energy or other mysterious anti-gravitational forces, but to the fact that time is slowing down.

In June 2012, José Senovilla, Marc Mars and Raül Vera from the University of Bilbao and the

University of Salamanca published an article in the journal Physical Review D in which they dismissed dark energy as an invention. Senovilla says that acceleration is a blunder caused by time that gradually slows down:

"*We do not say that the expansion of the universe is an illusion, what we say is that the acceleration of this expansion is an illusion. [...] in our equations we have naively maintained the flow of time constant, so the simple models we have built show that an acceleration of the expansion occurs.*"

The corollary of Senovilla's group is that dark energy does not exist and that we have been deceived into thinking that the expansion of the

universe is accelerating, when instead it is time that is slowing down.

Daily, this change is not perceptible, but when measurements are based on light emitted by stars exploded billions of years ago it is easily detectable.

Astronomers measure the rate of expansion of the universe using the red-shift technique and stars that move farther away appear to have a more marked red color. However, they treat time as a constant.

But if time slows down it becomes a spatial dimension. So, the most distant and ancient stars would seem to accelerate. Professor Senovilla says:

"*Our calculations show that we would fall*

into the illusion of thinking that the expansion of the universe is accelerating."

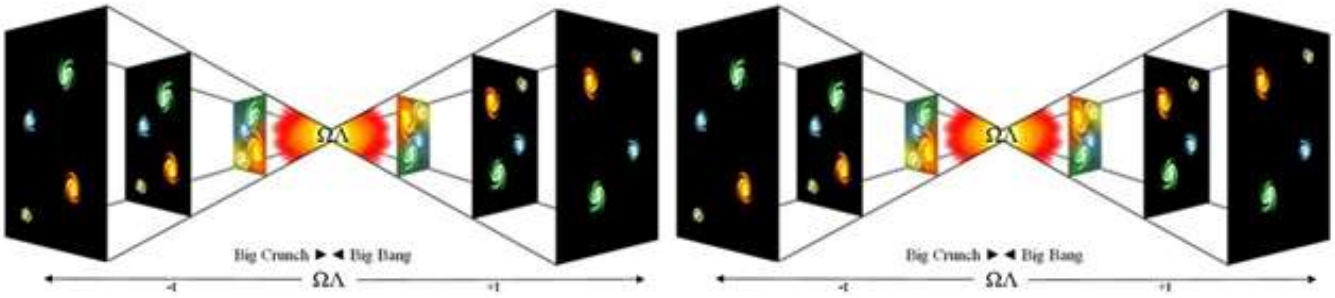
Although radical and in many ways unprecedented, this interpretation is not without its supporters. Gary Gibbons, a cosmologist at the University of Cambridge, says:

"*We believe that time has emerged during the Big Bang, and if time can emerge, it can also disappear - this is just the opposite effect.*"

The dual time solution of the energy-momentum-mass equation suggests an interpretation of the universe that vibrates between peaks of expansion and contraction. The fastest is the

expansion and the fastest is the forward flow of time, the fastest is the contraction and the fastest is the flow of time backwards.

The Big Bang is governed by positive time and entropy, that is energy and matter that diverge from an initial point, while the Big Crunch is governed by negative time and syntropy, that is energy and matter that converge towards a point of final density and infinite temperature.



Big Bang and Big Crunch cycles

The Big Bang is indicated with the

first letter Λ = Alpha (the beginning), of the Greek alphabet, while the Big Crunch with the letter Ω = Omega (the end).

The question that is often heard among cosmologists is why we live in a universe predominantly made of matter. What happened to antimatter? This question is easily answered when we consider the dual time solution. At the time of the Big Bang the amount of matter and antimatter was the same, but antimatter moved backwards in time, while matter moved forward in time, thus preventing their annihilation.

According to this interpretation, the universe is made of an equal amount of matter and antimatter, which move

in opposite time directions. Two symmetrical planes that influence each other in the continuous interaction between diverging and converging forces, causality and retrocausality, entropy and syntropy, heat and gravity, particles, and waves.

All that diverges is governed by the positive time solution, while all that converges is governed by the negative time solution. The physical and material plane continuously interacts with the non-physical and intangible plane of antimatter that propagates backwards in time.

The complexity of the physical universe is a consequence of the interaction between matter and energy with the cohesive forces of

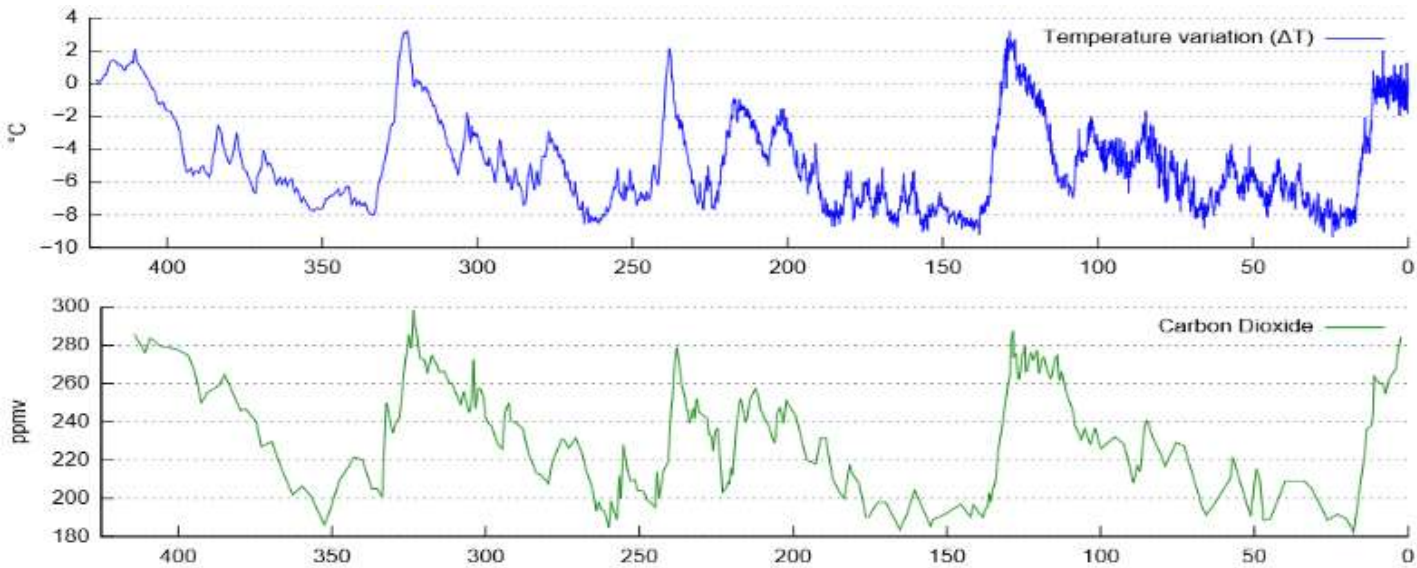
anti-matter and anti-energy.

The same model can be applied to atoms, small universes that expand and contract at immense speeds, where each vibration corresponds to an entire Big-Bang/Big-Crunch cycle. During the expansion phase the atom can emit an energy packet (a quanta), while during the contraction phase it can absorb an energy packet. Our universe would therefore be a Boolean universe made of packets, like computer bits.

In the same way our universe could be considered an atom of a much larger universe, and this in turn an atom of an even larger universe and so on towards the infinitely large and towards the infinitely small.

Cycles in climate changes

Cycles can be observed also in Climate Changes. There is no doubt that CO_2, temperatures, and sea levels are increasing. But if we look at it from a broader perspective, the picture seems affected by cycles.



Thousands years ago [27] – [28]

In this regard, the past can tell us a lot about the future.

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[27] en.wikipedia.org/wiki/Ice_age#/media/File:Vostok_Petit_data.svg

[28] CDIAC – Carbon Dioxide Information Analysis Center
http://cdiac.ornl.gov/images/air_bubbles_historical.jpg
http://cdiac.ornl.gov/trends/co2/ice_core_co2.html

When we examine data on carbon dioxide (CO_2) and temperatures, that are available for the last 800 thousand years, we see that our planet goes through regular cycles of warm periods, associated with increasing levels of CO_2, and ice ages of about 100 thousand years. The warm interglacial periods (with average temperatures above 0°C) last about 10 thousand years.

CO_2 is produced by life activities such as breathing and decomposition, industrial activities, and the use of fossil fuels such as coal, oil, and natural gas. CO_2 levels like or higher than the present one indicates that in addition to natural sources, industrial sources were present. CO_2 traps heat

providing a “warm blanket” to the planet. However, this “greenhouse effect” was never sufficient to compensate for the low temperatures of the ice age.

Civilizations that preceded us in previous interglacial periods seem to have used CO_2 to counteract the reduction in temperatures of the ice age. But none were successful.

The scenario is quite simple! When the ice age begins, temperatures fall by an average of 10/12 degrees. This drop in temperatures is slowed by high CO_2 levels. But when civilizations and life succumb to the ice age, CO_2 levels decrease, and polar ice caps expand to reach a thickness of 3 kilometers at latitudes like Rome

and New York. Oceans levels drop by about 300 meters and civilizations are forced to migrate towards the equatorial strip and occupy the land that was previously covered by the oceans.

At the end of the ice age the increase in temperatures is sudden. This causes the polar ice caps to melt into huge interglacial lakes. The banks of these lakes suddenly break, bringing water to increase the levels of the oceans of tens of meters at a time, wiping out what was left of the previous civilizations. Reports of these floods can be found in all the traditions and date back to around 12,000 years ago.

The warm period in which we live began 12,000 years ago and now we

are at the end, we are entering the next ice age!

Why are glacial cycles so regular?

Because the Sun is not constant in its emissions.

The solar cycles were discovered in 1843 by Samuel Heinrich Schwabe who after 17 years of observations noted a periodic change in the average number of sunspots in a progression that follows an 11-year cycle. Scientists were baffled by the fact that each cycle was a bit different, and no model could explain these fluctuations.

In 2015 it was discovered that these fluctuations are caused by a double

dynamo effect between two layers of the Sun, one near the surface and one inside its convection area. This model explains the irregularities of the past and predicts what will happen in the future.

Valentina Zharkova, one of the discoverers of this double dynamo effect, describes the results in this way:

"*We found magnetic waves that appear in pairs, originating from two different layers within the Sun. Both have a cycle of about 11 years, even if they are slightly out of phase. During the cycle, the waves float between the northern and southern hemispheres of the Sun. Combining these waves and comparing them with the real data for the past solar*

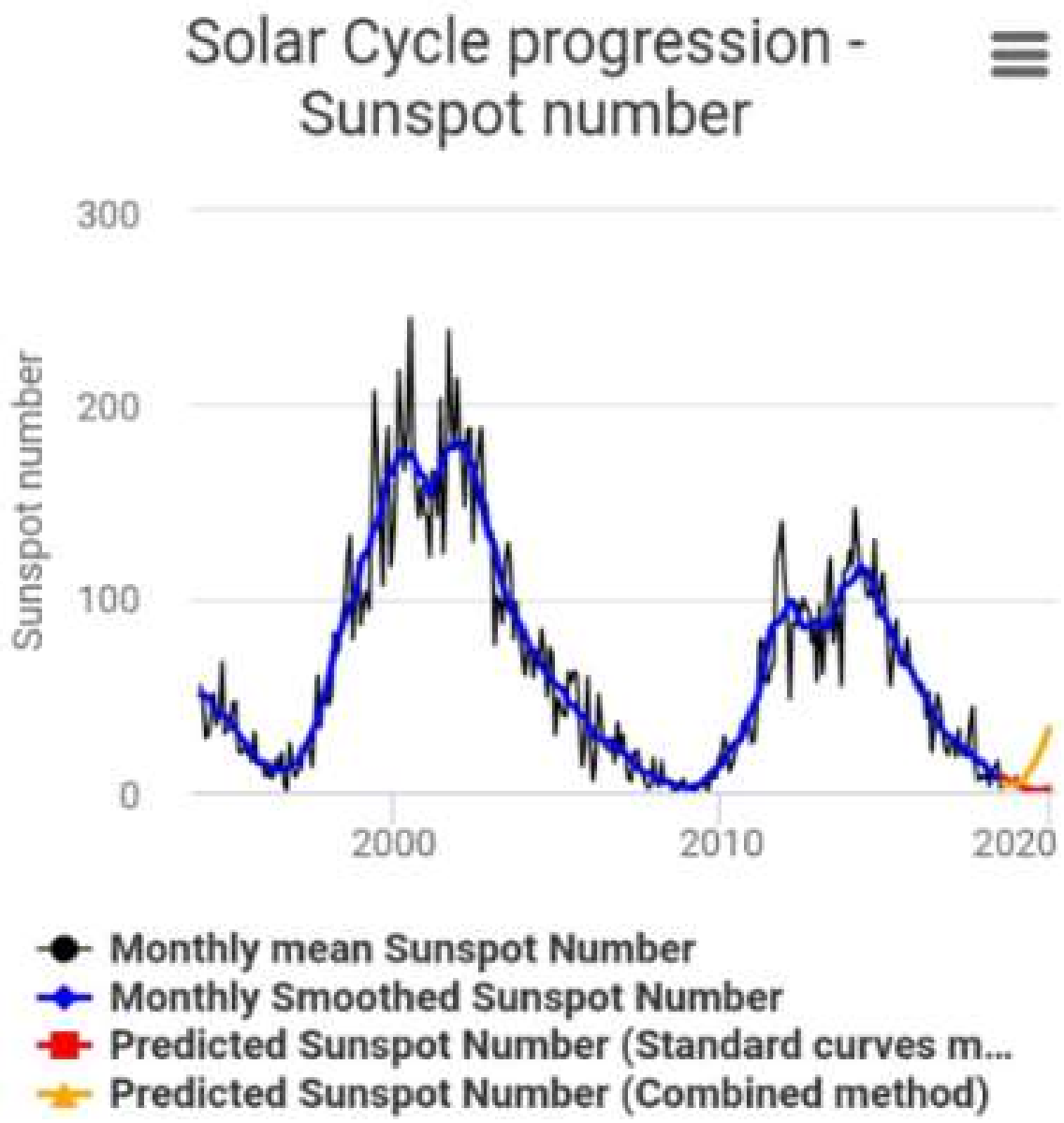
cycles, we found that our predictions are 97% accurate."[29]

Using this model to predict the future we see that the pairs of waves will become increasingly out of phase during cycle 25, which reaches its peak in 2022. In cycle 26, which covers the decade from 2030 to 2040, the two waves will become totally out of phase, and this will cause a significant reduction in solar emissions.

"*In cycle 26, the two waves are opposed to each other, with their peak at the same time but in opposite hemispheres of the Sun. Their*

[29] Royal Astronomical Society – *Irregular heartbeat of the Sun driven by double dynamo* https://www.ras.org.uk/news-and-press/2680-irregular-heartbeat-of-the-sun-driven-by-double-dynamo

interference will be destructive and will cancel each other out ... when the waves are in phase, they can show a strong resonance, and we have strong solar activity. When they are out of phase, we have solar minima."



www.spaceweatherlive.com

The Sun is falling asleep, and this is evident in the data available on the space weather website.

The last drop of 1.3 degrees Celsius in global temperatures led to the mini-glaciation of 1645-1715, a period known as the Maunder minimum, in which the hot seasons were short and there was a lack of food.

The double dynamo model forecasts a 60% drop in solar activity starting in the 2030-2040 period.

When solar emissions decrease, the magnetic shield that protects the planet weakens and cosmic rays enter the core, activating magma and causing strong earthquakes and volcanic eruptions. More than a

million volcanoes lie under the sea level against 15,000 on land. Increased eruptions of submarine volcanoes rise ocean temperatures, causing extreme weather conditions such as violent hurricanes and the increase in the amount of water vapor in the atmosphere.

Metabolism cycles

Since the concentration of energy cannot take place infinitely, when the limit is reached the process reverses and entropy takes over releasing energy and matter. In turn, the release of energy cannot be infinite, when the limit is reached the process reverses

and syntropy takes over concentrating energy and matter.

This process activates an exchange of energy and matter with the environment: syntropy absorbs and organizes, entropy releases and destroys. Exchange is essential in all living forms, from biological to economic ones. This continuous exchange is evident in metabolism, in the form of:

- *anabolism* (i.e., syntropy) which absorbs energy and leads to the formation of complex biomolecules from simpler ones and nutrients.
- *catabolism* (i.e., entropy) that

decomposes biomolecules in structurally simpler ones releasing energy in chemical (ATP) or thermal form.

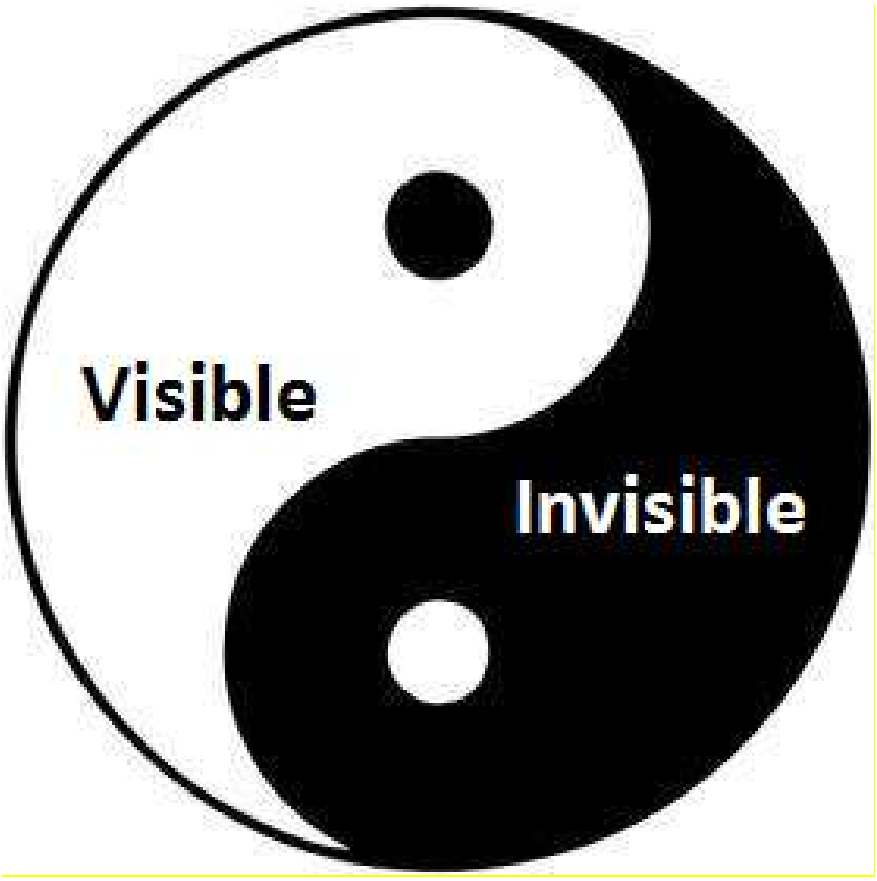
Cycles according to philosophies

The idea of a dynamic balance between two complementary forces, one diverging and one converging, one visible and one invisible, one destructive and one constructive, can be found in many philosophies and religious traditions.

In the Taoist philosophy, for example, all aspects of the universe are regarded as the interplay of two fundamental and complementary

principles: *yang*, which is converging, and *yin*, which is diverging.

This is beautifully represented in the Taijitu symbol, which shows the union and interaction of these two principles whose combined action is believed to move all aspects of the universe.



Taijitu symbol

In Hinduism the same law of complementarity is described with the cosmic dance of Shiva and Shakti, where Shakti is the personification of the feminine principle and is the energy of the visible physical world, and Shiva is the masculine principle, the ordering principle or consciousness that transcends the visible world.

Shiva would represent the organizing properties of syntropy and come from the future, whereas Shakti would represent the disordering properties of entropy and come from the past. Together they represent the dynamic organizing forces and the primordial cosmic energy that are expressed throughout the entire universe, and

one cannot exist without the other. Sometimes they are represented by a single figure called *Ardbanarisvara*, whose right side is male and whose left side is female.

TIME

The starting point of the supercausal paradigm is the concept of time according to which the present moment is the outcome of the interaction of the future and the past.

It can be useful to see how the concept of time has changed from Galilean relativity to Einstein's special relativity.

In 1623 Galileo formulated the law of composition of velocities which is also known as Galilean relativity.

This law stems from the fact that, when inside a system, it is impossible

to detect if it is moving with uniform motion. Galileo used the example of a ship travelling at a constant speed, without rocking, on a smooth sea. Any observer below the deck would not be able to tell whether the ship is moving or stationary.

Galileo formulated this concept in his Second Day of the *Dialogue Concerning the Two Chief World Systems*:[30]

"*Shut yourself up with some friends in the main cabin below decks on some large ship, and have with you there some flies, butterflies, and other small flying animals. Have a large bowl of water with some fish in it; hang up a bottle that empties drop by drop into a wide*

[30] Galileo Galilei, *Giornata Seconda del suo Dialogo sui Massimi Sistemi del Mondo* (1623)

vessel beneath it. With the ship standing still, observe carefully how the little animals fly with equal speed to all sides of the cabin. The fish swim indifferently in all directions; the drops fall into the vessel beneath; and, in throwing something to your friend, you need throw it no more strongly in one direction than another, the distances being equal; jumping with your feet together, you pass equal spaces in every direction. When you have observed all these things carefully (though doubtless when the ship is standing still everything must happen in this way), have the ship proceed with any speed you like, so long as the motion is uniform and not fluctuating this way and that. You will discover not the least change in all the effects named, nor could you tell from any of them whether the ship was moving or standing still.

In jumping, you will pass on the floor the same spaces as before, nor will you make larger jumps toward the stern than toward the prow even though the ship is moving quite rapidly, even though during the time that you are in the air the floor under you will be going in a direction opposite to your jump. In throwing something to your companion, you will need no more force to get it to him whether he is in the direction of the bow or the stern, with yourself situated opposite. The droplets will fall as before into the vessel beneath without dropping toward the stern, although while the drops are in the air the ship runs many spans. The fish in their water will swim toward the front of their bowl with no more effort than toward the back and will go with equal ease to bait placed anywhere around the edges of the bowl. Finally, the

butterflies and flies will continue their flights indifferently toward every side, nor will it ever happen that they are concentrated toward the stern, as if tired out from keeping up with the course of the ship, from which they will have been separated during long intervals by keeping themselves in the air. And if smoke is made by burning some incense, it will be seen going up in the form of a little cloud, remaining still and moving no more toward one side than the other. The cause of all these correspondences of effects is the fact that the ship's motion is common to all the things contained in it, and to the air also. That is why I said you should be below decks; for if this took place above in the open air, which would not follow the course of the ship, noticeable differences would be seen in some of the effects noted."

For an observer in the ship, it is impossible to conclude whether it is moving or stationary, whereas for an observer on another “inertial system”, for example on the seashore and looking to the ship in motion, the speeds of the bodies on the ship will add up to the speed of the ship. The Galilean law of composition of velocities consists of a set of rules which assume that time is constant, and speeds are variables and add up. For example, if a ship is moving at 20 km/h and a cannon ball is fired at 280 km/h in the same direction to the movement of the ship, the observer on the seashore will see the cannon ball move at 300 km/h: 280 km/h of

the speed of the cannon ball plus 20 km/h of the speed of the boat.

If the cannon ball were fired in the opposite direction to the movement of the ship the resulting speed would be 260 km/h: 280 km/h of the speed of the cannon ball minus 20 km/h of the speed of the boat (speeds are subtracted because they move in opposite directions).

On the contrary for a sailor on the ship sharing the same movement of the ship, the speed of the cannon balls would always be 280 km/h in any direction they are fired.

Therefore, an observer on the seashore sees the cannon ball moving at 300 km/h and the boat in the same direction at 20 km/h concludes that

the cannon ball was fired at 280 km/h.

Galileo's relativity is based on the principle that when changing inertial system, speeds are added or subtracted. Galileo's relativity allowed to generalize the laws of mechanics.

Two centuries later, in 1881, Albert Michelson began a series of experiments to measure the speed of the ether.

The wave theory of light postulated the existence of a substance for the propagation of light waves. It was thought, in fact, that light propagates in an element that permeates the entire universe.

But the nature of this substance was the source of numerous problems.

One was the fact that light required a solid ether and that the very high speed of propagation of light was possible if ether was highly rigid. Then the aberration of the light of the stars indicated that ether had to remain motionless, even at astronomical distances. However, no resistance to the motion of bodies could be attributed to ether.

Earth and the solar system orbit around the center of the galaxy at a speed of 217 km/s. A wind of ether with that speed would therefore have to invest our planet in the opposite direction to its motion: a variable ether wind according to the latitude, with a peak of 460 m/s at the equator. It was also known the motion of

Earth around the Sun at a speed of about 30 km/s.

Albert Michelson devised a tool that enabled to split light into two beams traveling along perpendicular paths which were then made to converge on a screen, where they formed an interference pattern. An ether wind would have resulted in a different speed of light in various directions and, consequently, a sliding movement of the interference fringes when rotating the apparatus with respect to the ether wind direction.

Using this device, now known as the interferometer, in 1881 Michelson accomplished several experiments, but he never detected the minimum displacement in the interference

fringes. He published the data and results in the same year.

Michelson interferometer was not sufficiently precise to exclude the existence of the ether and for this reason he asked the cooperation of Edward Morley, who made available his basement for new experiments with an interferometer mounted on a square stone slab of 15 cm and about 5 cm thick floating on liquid mercury, a technique which allowed to maintain horizontal the interferometer device and turn it around a central pin, eliminating any vibration.

A system of mirrors sent the beam of light which followed a path of eight round trips to make the beam of light

travel as long as possible.

However, even in this new set of experiments there was no trace of ether and the speed of light appeared to be independent of the direction of the path and a little lower to 300,000 km/s. The results were then confirmed by repeating the experiment at a distance of time and place and led to the famous conclusion that the speed of light is constant, and that ether does not exist.

The fact that the speed of light is constant undermines Galileo's relativity since the speed of light does not add up to the body that emits it and opened the door to a disturbing scenario, namely that the laws of

physics are local and cannot be generalized.

In 1905, analyzing Michelson, Morley, and Lorentz' results, Einstein overturned Galileo's relativity according to which time is absolute and speeds are relative.

To describe the fact that the speed of light is constant, it was necessary to accept that time is relative. Einstein developed this intuition in his Special Relativity.

Let us imagine, after 500 years, an astronaut on a very fast spaceship heading towards Earth at 20,000 km/s who shoots a laser light ray towards Earth (at 300,000 km/s). An observer on Earth will not see the laser light arrive at 320,000 km/s, as

Galileo's relativity predicts, but at 300,000 km/s (because the speed of light is constant and does not add up). According to Galileo's relativity, the observer on Earth would expect that the astronaut on the spaceship would see the light ray move at 280,000 km/s (300,000 km/s of the speed of light minus 20,000 km/s of the space ship) but, on the contrary, he also sees the laser ray move at 300,000 km/s.

Einstein suggested that what varies is time: when we move in the direction of light our time slows, and for us light continues to move at the same speed.

This leads to the conclusion that approaching the speed of light time would slow down and stop, and if we

could move at speeds higher than the speed of light, time would reverse.

In other words, events which happen in the direction in which we are moving become faster, because time slows down, but events which happen in the direction from which we are coming become slower, because time becomes faster.

Einstein concluded that with light what varies is not speed, but the flow of time.

Returning to the example of the spaceship, when we move in the direction of the light beam, our time slows, and for us the light continues to travel at 300,000 km/s.

In other words, events that happen in the direction in which we move

become faster, because time slows down, but events that happen in the direction from which we are moving from become slower because our time speeds up.

To explain this situation, Einstein liked to use the example of a lightning which strikes a railway simultaneously in two different points, A and B, far away from each other.

An observer sitting on a bench half-way would see the lightning strike the two points simultaneously, but a second observer on a very fast train moving from A to B passing next to the first observer at the moment in which the lightning strikes the two points would have already experienced the lightning striking

point B, but would have not experienced the lightning striking point A.

Even if the two observers share the same point of space at the same moment, they cannot agree on the events which are happening in the direction in which the second observer is moving. Agreeing on the existence of contemporary events is therefore linked to the speed at which the observers are moving.[31]

It is important to note that time flows differently if the event is happening in the direction towards which we are moving, or in the direction from which we are coming

[31] Einstein A. (1916), *Relativity: The Special and the General Theory.* www.amazon.it/dp/048641714X

in the first case they become slower and in the second case faster.

This example is limited to two observers; but what happens when we compare more than two observers moving in different directions at high speeds?

The first couple (one on the bench and the other in the train) can reach an agreement only on the contemporary existence of events which happen on a plane perpendicular to the movement of the train.

If we add a third observer moving in another direction but sharing the same place and moment with the other two observers, they will agree only on the contemporary existence

of events placed on a line which unites the two perpendicular planes.

If we add a fourth observer, they will agree only on a point which unites the three perpendicular planes.

If we add a fifth observer, who is not even sharing the same point in space, no agreement would be possible at all.

If we consider that only what happens in the same moment exists (Newton's time concept), we would be forced to conclude that reality does not exist.

To reestablish an agreement between the different observers, and in this way the existence of reality, we need to accept the coexistence of events which could be future or past for us, but contemporary for another

observer. Extending these considerations, we arrive at the necessary consequence that past, present and future coexist.

Einstein himself found it difficult to accept this consequence of special relativity.

WATER

We are accustomed to the fact that causes always precede their effects. But the energy/momentum/mass equation predicts three types of time:

– *Causal time* is expected when the forward-in-time energy solution prevails. That is when systems diverge, such as our expanding universe. In diverging systems entropy prevails, causes always precede effects and time flows 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.

– *Retrocausal time* is expected when the backward-in-time energy solution prevails. That is when systems converge, such as black holes. In converging systems retrocausality prevails, effects always precede causes and time flows backwards, from the future to the past. In these systems no delayed effects are possible and this is the reason why no light is emitted by black holes.

– *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 coexist and time is unitary: past, present and future coexist.

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

– *Kronos* describes the sequential causal time, which is familiar to us, made of absolute moments which flow from the past to the future.
– *Kairos* describes the retrocausal time. According to Pythagoras kairos is at the basis of intuitions,

the ability to feel the future and to choose the most advantageous options.

– *Aion* describes the supercausal time, in which past, present and future coexist. The time of quantum mechanics, of the sub-atomic world.

This classification of time suggests that syntropy and entropy coexist at the quantum level, i.e., the Aion level, and that at this level life originates. This statement is now supported by the fact that the functioning of living systems is widely influenced by quantum events: the length and strength of hydrogen bonds, the

transmission of electrical signals in the microtubules, the action of DNA, the folding of proteins.

A question naturally arises: how do the properties of life ascend from the quantum level of matter, the Aion level, to the macroscopic level, the Kronos level, transforming inorganic matter into organic matter?

In 1925 the physicist Wolfgang Pauli discovered in water molecules the hydrogen bond. Hydrogen atoms in water molecules share an intermediate position between the sub-atomic level (Aion) and the molecular level (Kronos), and provide a bridge that allows the properties of syntropy to flow from the quantum to the macro level.

Hydrogen bonds make water different from all other liquids, increasing its attractive forces (syntropy), which are ten times more powerful than the van der Waals forces that hold together other liquids, with behaviors that are in fact symmetrical to those of other liquid molecules.

Consequently, we can suggest that life originates at the quantum level, since at this level syntropy is available, and that thanks to water and the hydrogen bond, life rapidly grows into the macroscopic level which is governed by the opposite law of entropy.

To survive the destructive effects of entropy, life needs to acquire syntropy

from the quantum level and water provides the mechanism, becoming in this way vital.

Among the anomalous properties of water which recall the cohesive qualities of syntropy[32]:

- When water freezes it expands and becomes less dense. Other liquid's molecules when they are cooled concentrate, solidify, become denser and heavier and sink. With water exactly the opposite is observed.
- In liquids the process of solidification starts from the bottom, since hot molecules move

[32] Ball P. (1999), *H_2O A Biography of Water*, Phoenix Book, London.

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 snowballs, 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 bonds. Also, ammonia and fluoride acid form hydrogen bonds and these molecules show anomalous properties like water. However, water produces a higher number of hydrogen bonds, and this determines the high cohesive properties of water which link molecules in wide dynamic labyrinths.[33] Other molecules that form hydrogen bonds do not reach

[33] Bennun A. (2013), *Hydration shell dynamics of proteins and ions couple with the dissipative potential of H-bonds within water*, Syntropy 2013 (2): 328-333.

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 hydrogen bonds stop working and the flow of syntropy from micro to macro stops, bringing life to death.

Hydrogen bonds make water essential for life: water is ultimately the lymph of life which provides living systems with syntropy. Water is the most important molecule for life, which is necessary for the origin and evolution of any biological structure. Consequently, if life would ever be

discovered beyond Earth water would necessarily be present. [34]

[34] Vannini A. (2011) and Di Corpo U., *Extraterrestrial Life*, Syntropy and Water, Journal of Cosmology, journalofcosmology.com/Life101.html#18

THERMODYNAMICS

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

– *The law of conservation of energy*, which states that energy cannot be created

or destroyed, but only transformed.

- *The law of entropy*, which states that energy always moves from a state of availability to a state of unavailability. 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.
- *The law of heat death*, which states

that 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).

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*"[35],

[35] Eddington A. (1935) *New Pathways in Science*. Cambridge Univ.

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, life defies entropy. Life becomes more complex over time, through growth and reproduction, turning more of the physical universe from disordered atoms into very highly ordered molecules. 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, answering the question of what allows life to counter entropy, wrote:

"*It feeds on negative entropy. It is by avoiding the rapid decay into the inert state of 'equilibrium' that an organism appears so enigmatic; so much so, that from the earliest times of human thought some special non-physical or supernatural force (vis viva, entelechy) was claimed to be operative in the organism, and in some quarters is still claimed.*"[36]

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[36] Schrödinger E. (1944),*What is life*? whatislife.stanford.edu/LoCo_files/What-is-Life.pdf

The same conclusion was reached by Albert Szent-Györgyi (1937 Nobel Prize in Physiology and discoverer of vitamin C):[37]

"*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.*"

Györgyi continues suggesting the existence of a law symmetric to entropy:

[37] Szent-Györgyi A. (1977), *Drive in Living Matter to Perfect Itself*, Synthesis 1, Vol. 1, No. 1, 14-26.

"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 Györgyi, 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 energy momentum mass equation implies the following transformation of the laws of thermodynamics:

- *Principle of Energy Conservation*: energy can neither be created nor destroyed but can only be transformed.
- *Law of Entropy*: in an expanding universe energy is constantly

released in the environment. Entropy is the magnitude by which we measure the amount of energy that is released into the environment.

  - The increase of entropy is irreversible.
  - Time flows forward.
  - The system tends towards a state of thermodynamic death.

- *Law of Syntropy*: in a converging universe energy is constantly absorbed from the environment. Syntropy is the magnitude by which we measure the concentration of energy.
  - The increase of syntropy is irreversible.

    - Time flows backward.
    - The system tends towards a state of thermodynamic potentiality.
- *Law of Supercausality*: in a system were diverging and converging forces interact:
    - Differentiation and complexity increase.
    - Time is unitary.
    - Processes can be reversed.

LIFE

The first question about life, which has always puzzled scientists and philosophers, is this: *How can life develop from molecules that are not living*? To this question the ancient Greeks responded by saying that life spontaneously generates from inorganic matter because of the action of the goddess Gaia. This hypothesis was reformulated by the Latins as *generatio spontaneous* and in contemporary science as abiogenesis.

Some important dates in the debate between biogenesis and abiogenesis are the following:

- In 1668 the Italian physician Francesco Redi (1626-1697) proved that no maggots appeared in meat when flies were prevented from laying eggs, providing in this way the first solid evidence against the hypothesis of the spontaneous generation of life. Redi gradually showed that, at least in the case of all the higher and readily visible organisms, the abiogenetic hypothesis was false.
- Spontaneous generation for small organisms gained favor in 1745 when John Needham (1713-1781) showed that if a broth was boiled and then placed in a sterile

container it became cloudy, supporting in this way the theory of abiogenesis.

- In 1768 Lazzaro Spallanzani (1729-1799) repeated Needham's experiments, removing air from the sterile container. Spallanzani wanted to avoid contamination by boiling a meat broth in a sealed container. The problem with this approach was that air could shatter the container upon heating. Therefore, he removed the air from the container after sealing it. The broth did not subsequently cloud with bacterial growth, supporting in this way the theory of biogenesis.
- It was not until mid-nineteenth

century, almost 100 years later, that the great French chemist Louis Pasteur put the debate to rest. By passing air through cotton filters, he first showed that the air is full of microorganisms. Inspection of this material revealed numerous microbes. Pasteur realized that if these bacteria were present in the air, then they would likely land on and contaminate any material exposed to it. The debate brought the French Academy of Sciences to allocate a prize for whoever was able to provide a convincing and accurate experimental answer to the question. Pasteur entered the contest with experiments like those performed by Spallanzani, which

used heat to kill the microbes. In a simple, but brilliant modification, the neck of a flask, used in the experiments, was heated to melting point and drawn out into a long S-shaped curve, preventing dust particles and their load of microbes from reaching the contents of the flask. After prolonged incubation the flasks remained free of life, and this ended the debate for most scientists. Results were published in 1862 and explained the errors and artifacts of other competitors. Pasteur summarized his findings in the Latin phrase: *Omnevivum ex vivo,* indicating that life can only be generated from organic matter, from life. These findings further

restricted the abiogenetic hypothesis to special conditions which would have characterized the early stages of our planet.

– In 1924, Alexander Oparin (1894-1980) published in Russian a work entitled *The Origins of Life*[38] in which he describes that the findings on the characteristics of colloids suggest that the ability of colloids to bind substances to the surface indicates a beginning of metabolism. His book ends with the phrase: "*Work is already in a very advanced stage, and soon the last barriers between organic and inorganic will fall*

[38] Oparin A. (1924), *The Origin of life*, http://www.uv.es/orilife/textos/The%20Origin%20of%20Life.pdf

under the attack of a patient work and powerful scientific theories." The English version of Oparin's book was published in 1938 and has had a wide impact on researchers and public opinion.

– In 1952 Harold Urey (1893-1981) coined the term cosmochemistry, or chemical cosmology, to indicate the origin and development of the substances of the universe. The main focuses are the elements and their isotopes, primarily (but not always) within the solar system. Closely related fields are astrochemistry, a branch of astronomy concerned with measuring chemical elements in

other parts of our galaxy and in other galaxies. Cosmochemistry focused on the study of the chemical elements on Earth and planets during their evolution. In 1952, in the book *The Planets: Their Origin and Development*[39], Urey assumed that the composition of primordial Earth was like that of the cosmos: 90% hydrogen atoms, 9% of helium atoms, 1% atoms of other elements. From this assumption he deduced that the composition of the primordial atmosphere should be made of methane (CH_4), ammonia (NH_3), nitrogen (N_2), water (H_2O) and

[39] Urey H. (1952), *The Planets: Their Origin and Development*. Yale Univ. Press, 1952.

hydrogen (H_2).

– In 1953 a student of Urey, Stanley Miller (1930-2007), published the article *A Production of Amino Acids Under Possible Primitive Earth Conditions*.[40] Miller demonstrated that, in a primordial atmosphere and in the presence of water, the action of electrical discharges (simulating the action of lightning) could generate amino acids, that is the fundamental building blocks of proteins. In his experiments, which used sterile equipment, Miller inserted gases such as methane (CH_4), ammonia (NH_3) and water (H_2O). The system consisted of

[40] Miller S.L. (1953), *A Production of Amino Acids Under Possible Primitive Earth Conditions*, Science, May 15, 1953.

liquid water, gas and two electrodes. The experiment was divided into cycles in which water was heated to induce the formation of water vapor, the electrodes were used to produce electrical shocks like lightning and the whole was then cooled to allow water to condense. Then a new cycle began. After about a week of uninterrupted cycles, where the conditions were kept constant, Miller noted that about 15% of the carbon had formed organic compounds, including some amino acids. The idea was that this synthesis of amino acids would provide the building blocks for proteins. Miller's experiments

produced an aqueous mixture containing various products which were then isolated using a process of extraction. These products contained amino acids, including some of those found in living systems. This aqueous mixture was called primordial soup. Miller gave a decisive impetus to the experimental research of the abiotic origins of life.

The second question about life is this: *How did molecules, that are essential for life, form from amino acids*? Amino acids are the building blocks of life but are not considered to be living forms. Miller's experiments gave rise to a host of other experiments, which

are still being conducted to demonstrate the feasibility of constructing complex organic molecules from amino acids. These experiments are aimed at attempting to describe how proteins can form spontaneously starting from amino acids. Results have been very problematic, for several reasons:

– Proteins involved in the metabolism of cells are composed of chains which include more than 90 amino acids. Simple combinatory calculations show that more than 10^{600} (one followed by 600 zeroes) permutations are required to combine amino acids

by chance in a "spontaneous" formation of just one protein of 90 amino acids. Elsasser[41], in a work published in the American Scientist, shows that in the 13-15 billion years of our Universe a maximum of 10^{106} simple events (at the nanosecond level) have taken place. Consequently, any event which requires a combinatory value greater than 10^{106} simply cannot apply to our physical Universe. This number is greater than all the combinations which have taken place in its entire history, since the Big Bang. In other words, the possibility of the spontaneous

[41] Elsasser W.M., *A causal phenomena in physics and biology: A case for reconstruction*. American Scientist 1969, 57: 502-16.

formation of just one protein is nil. Elsasser's results show that "*the notion of mechanical causation in biology is devoid of logical underpinning*" and that "*the use of mechanical causation in life and ecology is metaphorical at best, and a very real danger exists that the use of this metaphor can too easily divert one's attention in the wrong direction*."

– In addition, primordial soups are made up mostly of water, but water leads to the decomposition of macromolecules and makes it impossible for amino acids to chain together in the initial stages of protein formation. In 2004, Luke Leman and collaborators at the Scripps Research Institute and

Leslie Orgel of the Salk Institute for Biological Studies[42], obtained peptides (short chains of amino acids) using solutions of amino acids, carbonyl sulfide (COS, a volcanic gas) and catalysts based on metal sulfides. But using this process it is not clear where the amino acids came from, since they require a totally different environment which is not based on water.

– Another proposal is that amino acids, which form in water, are concentrated in lagoons which periodically become dry and

[42] Leman L. (2004), Orgel L and Ghadiri MR, *Carbonyl Sulfide-Mediated Prebiotic Formation of Peptides*, Science 8 October 2004: 306 (5694), 283-286, DOI: 10.1126/science.1102722

condense under the influence of dry heat, which also creates chemical bonds responsible for the union of amino acids (peptide bond).

- The processes of synthesis have allowed to produce 13 of the 20 amino acids involved in the construction of proteins. In addition to these, thousands of other amino acids are generated, which are not present in living organisms.
- If it were possible to select and combine only the amino acids present in living systems (the probability is equal to zero), the resulting combinations would be

three-dimensional and not linear, such as that which is present in life's protein chains. The three-dimensional combinations (known as proteinoids) are inappropriate to the metabolism of cells because they cannot be encoded by a linear genetic code. Proteinoids are therefore given no value in the formation and development of life.

– Life, as we know it, depends totally on levorotatory amino acids whereas the synthesis of amino acids leads to the formation of an equal number of dextrorotatory and levorotatory chains. The production of proteins in laboratories is therefore unsuitable

for the formation of living organisms.

- The synthetic processes for the construction of protein chains leads to the formation of monofunctional molecules that block the ends of the chains, making them inaccessible for further extensions. The presence of monofunctional molecules is therefore a crucial impediment to the development of longer chains, i.e., proteins.
- In all the experimental approaches, in addition to the desired amino acid, many other substances, which prevent the next steps, are formed.

The third question about life is: *What differentiates the organic from the inorganic*? Miller's experiments constitute an important first step towards the synthesis of the molecules which are necessary for life but have also led to an impasse.

The synthetic production of proteins requires complex procedures of isolation and purification that do not occur spontaneously in nature and are based on assumptions, models and projects which derive from the study of living systems. These models involve theoretical assumptions, about the relationship between inanimate matter and life, which are defined by the various and fundamental characteristics of

organisms discovered thanks to observation, such as the intake of substances and energy from the environment, reproduction, growth, mobility, reaction to stimuli, processing of information.

All these features allow to describe different aspects of life. For example, the description of molecular structures allows the understanding of the physical characteristics of organisms and biochemical processes, but this identifies only some individual aspects of the manifestations of life. The same happens with the definition used in exobiology (search for life beyond Earth), according to which life would be a chemical system capable of

evolution and reproduction.

The development of models which describe the transition between inanimate matter and life is a consequence of the definition of life which is given in theoretical models. The vast and fascinating knowledge developed studying the details and the reciprocal interactions of molecules and macromolecules, involved in the creation of living organisms (proteins, DNA), has not yet solved the mystery of life.

We know about life only in relation to material components, but we also know that the DNA macromolecules, for example, can perform their functions only within the highly structured complexity of a cell. This

indispensable whole is a prerequisite for life, and this requires an approach that considers complexity, since the individual and isolated feature alone would have no chance of success.

An unambiguous definition of life is still missing.

Taxonomy

Cataloguing and classifying living organisms is one of the oldest and main objectives of biology and is referred to as "taxonomy." The term comes from the Greek word taxis (ordering) and nomos (rule). In biology, a taxon (the plural is taxa) is a taxonomic unit, a group of real

organisms, morphologically distinguishable and / or genetically recognizable from others as a unit with a precise location within the hierarchy of the taxonomic classification. Carl Linnaeus (1707-1778), the father of taxonomy, based the classifications mainly on the external features of living things and this procedure is sometimes referred to as Linnaean taxonomy. Only later taxonomy was expanded to anatomy, i.e., the skeleton and soft parts, and molecular and genetic information. Morphological taxonomy attempts to classify living beings according to their similarities, using neutral and objective descriptions.

Taxonomy is an empirical science

which uses ranks, including, among others: kingdom, phylum, class, order, family, genus, species. In zoology, the nomenclature for the more important ranks is strictly regulated by the ICZN Code (International Commission on Zoological Nomenclature), whereas taxonomy itself is never regulated, but is always the result of research in the scientific community. How researchers arrive at their taxa varies. It depends on the available data, and resources and methods can vary from simple quantitative or qualitative comparisons of striking features to elaborate computer analyses of large amounts of DNA sequence data.

For this reason, researchers can produce different classifications due

to a series of subjective choices. For example:

- Depending on which features we choose to consider, the classifications can change.
- The similarity values used in statistical analyses can be changed, and this can lead to place individuals into taxa that are close to the critical values of similarity.

To overcome the limitations of subjective choices genetic taxonomy was developed. Genetic taxonomy is based on the idea that couples that produce fertile progeny belong to the same taxa. The genetic approach

classifies species according to their ability to produce fertile offspring under conditions of natural life. If organisms produce fertile offspring only when artificially crossed, in captivity or breeding, they are counted in different species. For example, a mule is the product of a horse and donkey and is barren. The genetic approach therefore leads to catalogue horses and donkeys as different species.

Biological taxonomy is therefore divided mainly into morphological taxonomy, which considers the external features (morphospecies) and genetic taxonomy which considers fertility (genospecies).

Depending on whether the emphasis

is put on the genetic (fertility) or morphological (features) the boundaries between species can vary. In the case of donkeys and horses there are two genospecies and one morphospecies, since they are indistinguishable based on their external features, and therefore belong to the same morphospecies, but do not produce fertile offspring, and therefore do not belong to the same genospecies.

To overcome this discrepancy, the base-type classification was introduced which takes into account both classifications: the reproductive behaviors and the morphological features. However, even the base type classification has not managed to

produce generally accepted taxa. The geneticist W. Gottschalk says:

> "*Despite decades of research, the definition of species as a biological unit presents great difficulties. To date there is still no single definition that meets all the requirements.*"[43]

The common definition of species, genospecies, morphospecies and base type, are imprecise since they do not permit a clear and always valid delineation among taxa. By applying different definitions of species, inevitably the boundaries change. This raises the question whether it is possible to define higher taxonomic

[43] Gottschalk W. (1994), *Allegmeine Genetick*, Stoccarda.

units that encompass the concepts of both genetic and morphological species.

Microevolution

Charles Darwin (1809-1892), in *The Origin of Species*[44], described the variability among species and the fact that in the long-term population size remains constant, despite the overproduction of progeny. Darwin concluded that only the best and fittest individuals survive and become the parents of the next generation. This process of natural selection

[44] Darwin C (1859), *On the Origin of Species by Means of Natural Selection*, London, 2nd edition 1964, Cambridge: Harvard University Press.

would be enhanced by genetic drift, i.e., the tendency of alleles, which are responsible for the ways in which the hereditary features manifest, to randomly combine during reproduction. Positive combinations would increase the chances of survival and would be therefore selected, becoming a common feature. Only random variations (mutations) which directly or indirectly benefit the possibilities of survival and contribute to evolutionary progress are selected whereas deleterious mutations are mostly eliminated. This mechanism favors advantageous mutations and plays an important positive role in the evolutionary process. For Darwin, natural selection and genetic drift are

the key elements of the evolutionary process. However, it is generally accepted that the mechanism of natural selection and genetic drift operate only within the context of microevolution.

The terms microevolution and macroevolution were introduced in 1927 by Philiptschenko[45], where:

- *Microevolution* indicates the selection of features within the same species, for example: quantitative changes of organs and structures of existing bodies.
- *Macroevolution* indicates the evolution of new features, for

[45] Philiptschenko J. (1927), *Variabilitat und Variation*, Berlin.

example: the development of organs, structures, and forms of organization with qualitatively new genetic material.

The function of microevolution is to optimize existing structures, whereas the function of macroevolution is to develop for the first time, or from scratch, structures with new functions.

An example of microevolution is provided by seeds carried by wind, which fail to germinate in soils polluted by heavy metals.

In landfills in Britain, it was observed that a minority of seeds can germinate, grow and make seeds that can colonize soils polluted by heavy

metals. These offspring show the inability to re-cross with their parental plants growing on normal uncontaminated soils. Based on the definition of genospecies, one can therefore say that a new species is born.

Can these processes be used as evidence of the development of a new specie with new information?

Genetic analysis shows that these new plants, that can grow on contaminated soils, have not developed a new character, but the tolerance to the high content of heavy metals derives from the fact that the absorption of minerals from the soil is limited.

The genetic information has been

limited, and it is not an evolutionary progress due to new information.

The example of plants colonizing mine landfills, as well as other examples of this type, proves that the process of microevolution should not be considered a development towards higher forms, but an impoverishment of the genetic information, a specialization with depleted genetic information. These plants are more tolerant to heavy metals but are less adjustable to environmental changes and are more at risk of extinction.

When this process of selection is repeated, it results in massive depletion of the genetic information. These new breeds are more suited to specific environments, more

specialized, but also less flexible.

Another example of microevolution is provided by the cheetah, the fastest mammal on the planet. The depletion of the genetic information, due to specialization, is not reversible and tends to bring this species to extinction. Despite its extraordinary abilities as a predator, the cheetah is endangered because of its very low genetic variability and information which makes the species all very similar. This specialization leads to illnesses, a high percentage of abnormal sperm, the fact that after hunting these predators are so tired that they become unable to defend their prey from other competitors, such as lions, leopards and hyenas,

and an insufficient capacity for adaptation that increases the risks of extinction.

The formation of new species (*Speciation*) observed to date is limited to microevolution processes of specialization governed by natural selection which selects the genetic potentials of species.

Observations suggest that species start from a condition in which large quantities of genetic information is available; gradually this potential is reduced because of natural selection, guided by events of colonization and isolation. This reduction of the original variability of genetic information allows the colonization of new habitats, but limits future

possibilities of adaptability.

Speciation, as it is known today, is based on the loss of genetic information due to environmental conditions and the processes of specialization.

An important role in microevolution is played by genetic drift, i.e. by the recombination of parental genes during sexual reproduction that leads to the formation of a virtually unlimited number of new combinations.

The biological importance of sexual reproduction is explained by the fact that it enhances the possibilities of natural selection. But, since genetic recombination does not produce anything new, natural selection is

confined only within microevolution. No new genetic material is formed, but only pre-existing genes and alleles are recombined, mixed, and selected.

Macroevolution

Unlike microevolution, which is based on genetic drift, natural selection and speciation which progressively reduce the genetic information, macroevolution requires mechanisms that can increase and produce new information.

However, so far, only microevolution processes of specialization have been observed. Evolutionary factors such as natural

selection, genetic drift and isolation do not seem to provide explanations regarding macroevolution.

Consequently, macroevolution has been understood and is understood in very different ways:

- Some authors use it to indicate mechanisms other than Darwin's gradualism which are insufficient to explain the development of new complex organs (such as the development of wings or legs, etc.).
- Others use it in a descriptive way, without any comment on the mechanisms.
- Some use it to indicate evolution beyond the species level. The

difference between microevolution and macroevolution becomes the border between species.

- Sometimes a distinction is made by discipline: macroevolution is studied by paleontologists whereas microevolution by biologists.
- The boundaries between micro and macroevolution are fluctuating and it is not possible to distinguish between these two terms.
- Others reject the term macroevolution on the grounds that there is only one evolutionary mechanism.

Genetic mutations appear spontaneously in nature (without

apparent causes) and can also be artificially induced or favored, for example by treatment with chemicals, radiation, and temperature changes. However, artificial mutations limit evolution to the field of microevolution.

Empirical findings show that these mutations can explain the separation of a parental species into two or more species (speciation), but they do not explain the increase in information. Offspring specialize in different directions but cannot increase their information. One wonders then:

– if there are known mechanisms that explain macroevolution.

– if there are clues that suggest that macroevolution is possible.
– if the equation *microevolution* + *time* = *macroevolution* is correct.

A first consideration about the action of natural selection is that a series of mutations that should initiate the development of a new organism (macroevolution) would survive only if every single change causes a selective advantage or, at least, not a disadvantage.

This means that the evolution of a new organ or structure cannot go through intermediate stages which are disadvantageous and would not survive natural selection. Living

systems must be able to survive in each stage of the evolutionary process. For this reason, it is difficult to explain the development of complex organs, since the intermediate stages would result in a disadvantage which would be eliminated by natural selection.

In the formation of new organs and structures, in general, a selective advantage is given only after their completion.

The early stages of a new body represent a pure waste of material and until the process is completed do not offer any selective advantage. Therefore, incomplete intermediate forms would be eliminated by the mechanism of natural selection.

The biological value of an organ is given only when the various functions can interact. Simulating the evolution of new organs using computer software, advantageous intermediate stages should be achieved in a very limited period of time; but neither the computational nor biological models can account for these quick intermediate stages of evolution.

Advantageous intermediate stages require information on mechanisms, rates of mutation and recombination, suitable and appropriate selection criteria, and population size, which in simulations need to be introduced artificially (from outside) showing that the processes of macroevolution require good technology, good

programs, and software, but there is no known natural source that can provide these resources, programs and information.

From the evolutionary point of view, the unsolved question is not about the existence of advantageous mutations, but the possibility of the development of new genetic material and new structures.

Darwin believed that similar features are hereditary, for example children resemble their parents, and for this reason he argued that similar species, such as chimpanzees and humans, should have common ancestors. This hypothesis requires the existence of numerous intermediate links which should testify the evolution between

chimpanzees and humans, but these links are missing and have not been found so far. Occasionally there are fossils that are interpreted as links, but their interpretations have resulted fundamentally controversial.

Phylogenetic theory cannot ignore the fact that these links are missing. Darwinists try to explain their absence by saying that evolutionary processes took place in marginal populations with a low probability of fossilization.

The theory of macroevolution also maintains that affinities should be interpreted as convergences. But how can an evolutionary process without a tendency converge towards similar results? The convergence is usually explained by saying that evolution has

been strongly channeled by similar selective processes. But fossils show that regarding size, morphology, ecology, stages of development and reproduction, old species cannot be distinguished from recent ones, suggesting a substantial constancy of species.

While biology examines living species, paleontology studies the world of plants and animals which existed on our planet in the past and it is therefore considered to be a science of origins and evolution.

According to the macroevolution doctrines, each type of organization would have developed gradually, and links existed between and among different types, gradually developing

in higher forms and organisms. But paleontologists have failed to provide any evidence for the existence of these links.

On the contrary, they have provided evidence of a substantial constancy of species.

For example: the major groups of plants appear suddenly and not in a gradual way and species often appear in the wrong chronological order (the most complex and evolved appearing first).

Within the same taxa, it is usually impossible to show a trend from simple to complex, for example, under the Psilophyton taxa, the oldest forms are the most complex in the stratigraphic sequence. In most cases,

family trees can be reconstructed only if we admit the possibility of convergence and reversions (i.e., the return to original features).

According to generally accepted studies, spores appear before macrofossils (wood, leaves, etc.). No one knows why this could have happened.

Converging evolution

At the beginning of chapter 21 of his second book on the "*Descent of Man*", published 12 years after the "*Origin of Species*", Darwin says:[46]

[46] Darwin C., *Descent of Man*, 1871. infidels.org/library/historical/charles_darwin/descent_of_man/

"It seemed worthwhile to try how far the principle of evolution would throw light on some of the more complex problems in the natural history of man. False facts are highly injurious to the progress of science, for they often endure long; but false views, if supported by some evidence, do little harm, for everyone takes a salutary pleasure in proving their falseness: and when this is done, one path towards error is closed and the road to truth is often at the same time opened."

Darwin's "*road to truth*" suggests the possibility of a hidden converging evolution.

One of the main postulates of the entropy/syntropy hypothesis is that

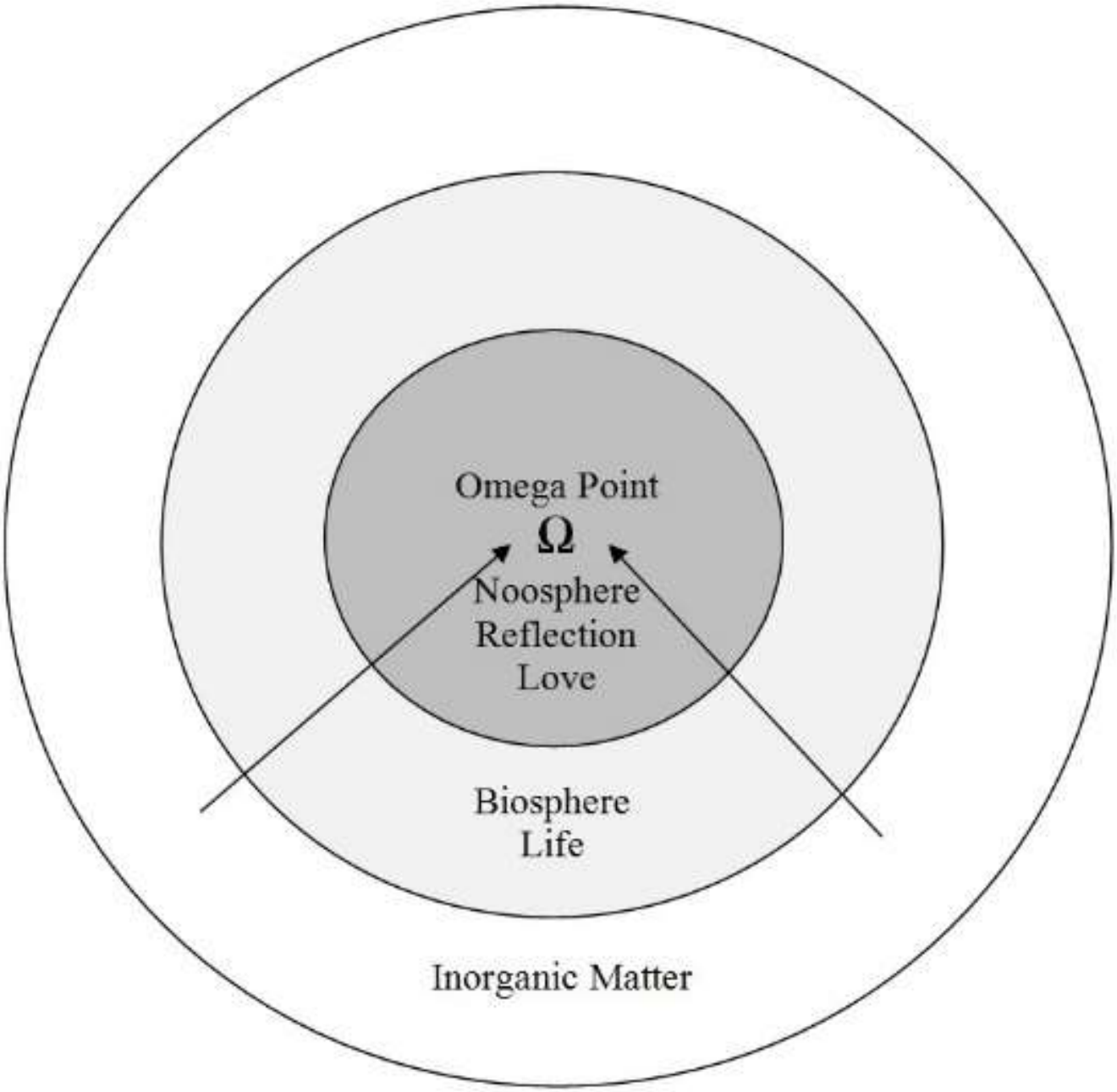
life converges towards attractors, which guide in a retrocausal way the evolution of living systems.

A similar converging evolution hypothesis was formulated by Pierre Teilhard de Chardin. Teilhard was a paleontologist and a well-known evolutionary scientist and became famous after his death with the publication of his books, among which *The Phenomenon of Man* and *Towards Convergence*. His hypothesis broadens science to a new type of causality which retro-acts from the future. The entropy/syntropy hypothesis states that life is subject to dual causality, efficient causality, and final causality. For Teilhard life is guided by final causality which leads

to converge towards the Omega point, the source of life.

Teilhard considered reality organized on three main concentric spheres:

- The innermost sphere is the final aim of the evolution of the universe, in which all of matter will be transformed into organic and conscious matter, and it is also the closest to the Omega point.
- The outer sphere is the most distant from the Omega point, the realm of inanimate matter.
- The middle sphere is the realm of life which does not yet reflect on itself, the biosphere.



Teilhard adds that:

"Evolution cannot be measured along the line that goes from the infinitely small to the infinitely big, but according to the axis

that goes from the infinitely simple to the infinitely complex. We can represent evolution as distributed on concentric spheres, each of which has a radius that diminishes as complexity grows."[47]

In his childhood Teilhard's idol was represented by solid matter: the *God of Iron*.

He soon reached the conviction that the consistency of solid matter was not given by the substance itself, but by convergence. The theme of convergence became soon fundamental in Teilhard's vision.

Working as a paleontologist Teilhard showed that life evolves converging

[47] Teilhard de Chardin P. (2008), *The Phenomenon of Man*, www.amazon.it/dp/0061632651/

towards attractors and that during this converging process unity, complexity, and diversity increase.

Teilhard relates the Omega point to consciousness.

The entropy/syntropy hypothesis considers syntropy the attractor of life and the source of the feeling of life, consciousness. Consequently, increasing syntropy increases consciousness.

Teilhard expresses this concept 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."

Concentration and convergence are the key concepts in Teilhard's vision of evolution:

"*Viewed at the more essential level we see that the universe is a system of center-complexification. Evolution does not match a transition from the homogeneous to the heterogeneous, but a transition from the heterogeneously dispersed to the unified and complex, even more clearly, the transition from a minimum to a*

maximum of center-complexification."[48]

Teilhard sees consciousness as a universal property, a cosmological property of the universe which arises while converging towards unity.

"*Consciousness increases in proportion to the complexity of life. Consciousness is absolutely inaccessible to our means of observation at the small level of viruses, but it clearly appears at the maximum level of complexity of the human brain*."

Both Fantappiè and Teilhard's explain macroevolution because of intelligent in-formation provided by

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

attractors, and ultimately by the Omega point, which would allow the development of new organs, without any intermediate evolutionary steps that would constitute a disadvantage.

Attractors in-form our body and guide it to specific shapes and structures. Macroevolution would therefore be a converging retrocausal process and this is continuously observed when studying life in laboratories.

The hypothesis that a different type of causality is required, had been postulated by Hans Driesch (1867-1941), a pioneer in experimental research in embryology.

Driesch suggested the existence of final causes, which act in a top-down

way (from global to analytical, from the future to the past) and not in a bottom-up way, as it happens with classical causality.

Final causes would lead living matter to develop and evolve, and would coincide with the purpose of nature, the biological potential.

Final causes were named by Driesch *entelechy*.[49] Entelechy is a Greek word whose derivation (en-telos) means something that contains its own end or purpose, and that evolves towards this end. So, if the path of normal development is interrupted, the system can achieve the same end in another way.

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[49] Driesch H. (1908), *The Science and Philosophy of the Organism*, www.gutenberg.org/ebooks/44388

Driesch believed that the development and behavior of living systems are governed by a hierarchy of entelechies, which all result in an ultimate entelechy.

The experimental demonstration of this phenomenon was provided by Driesch using sea urchin embryos. Dividing cells of the embryo of sea urchin after the first cell-division, he expected each cell to develop into the corresponding half of the animal for which it had been designed or preprogramed, but instead he found that each developed into a complete sea urchin. This also happened at the four-cell stage: entire larvae ensued from each of the four cells, albeit smaller than usual. It is possible to

remove large pieces from eggs, shuffle the blastomeres and interfere in many ways without affecting the resulting embryo. It appears that any single monad in the original egg cell can form any part of the completed embryo. Conversely, when merging two young embryos, a single sea urchin results and not two sea urchins.

These results show that sea urchins develop towards a single morphological end. The moment we act on an embryo the surviving cell continues to respond to the final cause that leads to the formation of structures. Although smaller, the structure which is reached is similar to that which would have been obtained

by the original embryo.

It follows that the final form is not caused by the past or by a program, a project or a design which act from the past, since any change we introduce in the past leads to the same structure. Even when a part of the system is removed or the normal development is disturbed, the final form is reached, and it is always the same.

Another example is that of the regeneration of tissues. Driesch studied the process by which organisms are able to replace or repair damaged structures. Plants have an amazing range of regenerative capabilities, and the same happens with animals. For example, if a flatworm is cut into pieces, each piece

regenerates a complete worm. Many vertebrates have extraordinary capabilities of regeneration. If the lens of the eye of a newt is surgically removed, a new lens is regenerated from the edge of the iris, whereas in the normal development of the embryo the lens is formed in a very different way, starting from the skin.

Driesch used the concept of entelechy to account for the properties of integrity and directionality in the development and regeneration of bodies and living systems.

Independently in 1926 the Russian scientist Alexander Gurwitsch[50] and

[50] Gurwitsch A.G.(1944), *The Theory of Biological Field*, Moscow: Soviet Science, 1944.

the Austrian biologist Paul Alfred Weiss[51] suggested the existence of a new causal factor, different from classical causality, which was named morphogenetic field. Apart from the claim that morphogenetic fields play an important role in the control of morphogenesis (the development of the shape of the body), neither author showed how causality works in these fields.

The term "field" is currently fashionable: gravitational field, electromagnetic field, individual field of particles and morphogenetic field. However, the word field is used to indicate something that is observed, but not yet understood in terms of

[51] Weiss P.A. (1939), *Principles of Development*, Henry Holt and Co.

classical causality; events that require a new type of explanation based on a new kind of causality.

The entropy/syntropy hypothesis replaces the terms entelechies and fields with the term attractor. An attractor is a cause retroacting from the future which guides and generates a field.

The biologist Rupert Sheldrake[52] refers to the theory of René Thom "*The theory of catastrophes*" which identifies the existence of attractors at the end of any evolutionary process.[53]

Thom introduced the hypothesis that the shape could be due to causes

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

[53] Thom R. (1972), *Structural Stability and Morphogenesis*, W. A. Benjam, (1972), ISBN 0-201-40685-3.

that act from the future and Sheldrake added the hypothesis of formative causation according to which morphogenesis (the development of the shape) is guided by attractors (i.e. retrocausal processes). The term comes from the Greek root morphe/morphic and is used to emphasize the structural aspect.

Experimental results that can be easily explained in terms of attractors, were provided by Sheldrake. Members of the same group, such as animals of the same species, can 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 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.

Sheldrake explains these strange results introducing 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 fields. First there is the gravitational field (…) then there is the electromagnetic field (…) third, the quantum field theory (QFT), and so on.*"

Sheldrake's morphogenetic fields are a combination of the concepts of fields and energy.

Energy can be considered the cause of change. Fields can be considered the project, the way in which energy is guided.

Fields have physical effects, but are not themselves a type of energy, they guide energy in a geometric or spatial organization.

Attractors

The entropy/syntropy hypothesis translates the word fields into attractors and "morphogenetic fields" into "morphogenetic attractors" or

“morphogenetic retrocausality.” It agrees with the statement that morphogenetic fields would be at the basis of formative causation, morphogenesis, macroevolution, and the maintenance of the shape of living systems at all levels of complexity, not only on the surface, but also in internal processes.

Attractors provide the project and the design, with properties like those of Driesch’s entelechy.

For example, 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 to produce a different house.

When building a house there is a field that corresponds to the project. The project is not present in the building materials, which can therefore be used in many different types of projects. The project gives stability and leads the building material to converge and cooperate, despite individual differences.

The project represents the cohesive force of syntropy that brings parts together and contrasts the diverging tendency of entropy.

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 a project that drives the living system towards a specific form and evolution.

In 1942, Conrad Waddington coined the term *epigenetics* 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 protein requires at least 10^{600} mutations. It should also be noted that epigenetics implies that some mysterious mechanism has placed the properties of life in genetic programs and genetic instructions.

Attractors provide programs and instructions and constitute the common denominator of a collectivity of individuals. For example, the attractor humanity is the common denominator of all human beings, the attractor mice is the common denominator of all mice.

Besides providing programs and instructions, attractors act as relays of

information. They receive the experiences of individuals, select what is advantageous for the specie and transmit it to all the other individuals. This mechanism explains 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. Genes might not store information, but 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, cells are no longer finalizes, guided by the project, and tumors arise.

We have seen that Darwin's theory of evolution is valid within microevolution. We now add that macroevolution can be a product of attractors and of the properties of syntropy.

An example taken from our everyday life can help to clarify this concept.

The shape and structure of our body shows that we do not have claws to hunt, we do not have canine teeth typical of carnivores, the digestive tract is so long that meat remains in the intestines producing dangerous toxins. We eat only meat which has been matured (in an advanced state of decomposition), the smell of animal hormones is sickening to us and for this reason we castrate animals before

slaughtering them. The shape and structure of our bodies tell that the attractor is not that of a carnivorous animal. We can therefore forecast that mankind will evolve naturally and inevitably into vegetarian habits.

Following classical logic, one would conclude that we lack the features typical of carnivorous animals, since at the beginning of our evolution we were vegetarians and fruit-eating animals, and only recently we have become omnivores. On the contrary, following the retrocausal logic, we say that we lack the features typical of carnivorous animals since our goal, our attractor, is to evolve towards a vegetarian diet.

Our current characteristics do not

depend on a hypothetical vegetarian past, but are determined by the future, by the attractor which is guiding us.

The supercausal hypothesis reverses the traditional way of thinking and introduces the idea that intelligent causality retroacts from the future providing projects and guidance.

Whereas causality produces effects that diverge from the past, retrocausality produces effects that converge towards attractors which act from the future.

Attractors are non-local. They select the information which is "*advantageous*" for life, changing it into in-formation, and share it instantaneously. As explained by

Barrow and Tipler[54], in the *Anthropic Principle*, this mechanism has brought the Universe towards physical constants that happen to fall within the narrow range which is compatible with life. The Universe seems to be compelled (attracted) towards those conditions which favor life.

Shared in-formation is like what the *Quantum Hologram hypothesis*[55] describes. The idea of a holographic mechanism for conveyance of life designs goes back to the mathematical insights of Dennis Gabor[56] and quantum holograms by Dr. Walter

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[54] Barrow J.D. and Tipler F.J. (1988), *The Anthropic Cosmological Principle*. Oxford University Press. ISBN 978-0-19-282147-8.

[55] Mitchell E. (2008), *The Way of the Explorer*, www.amazon.com/dp/1564149773

[56] Gabor D. (1946), *Theory of communication*, Journal of the Institute of Electrical Engineers, 93, 429-441

Schempp[57], a mathematician at the University of Siegen in Germany. The term "Holographic" implies that processes are holistic and postulates that the whole is more than the sum of its parts since information spreads everywhere to entangle the parts. In this domain, space and time no longer exist and neither does causality in Aristotle's sense of efficient causation, whereas Aristotle's more comprehensive formal or formative causation is appropriate.

In 1963 the meteorologist Edward Lorenz discovered the existence of attractors. Studying, for example, a simple mathematical model of

[57] Schempp W. (1993) *Cortical Linking Neural Network Models and Quantum Holographic Neural Technology*. In Pribram, K.H. (ed.) Rethinking Neural Networks

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 what were named the *chaotic attractors of Lorenz*. These attractors cause 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.*" The concept of the butterfly effect flourished in popular culture and became the central tenet of chaos theory. This beautiful image provides

a striking analogy for how small actions can have tremendously powerful effects – often independent of the intent of the initial action.

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[58] in 1975 and derives from the Latin word *fractus* (broken), similarly to the word fraction, since fractal images are

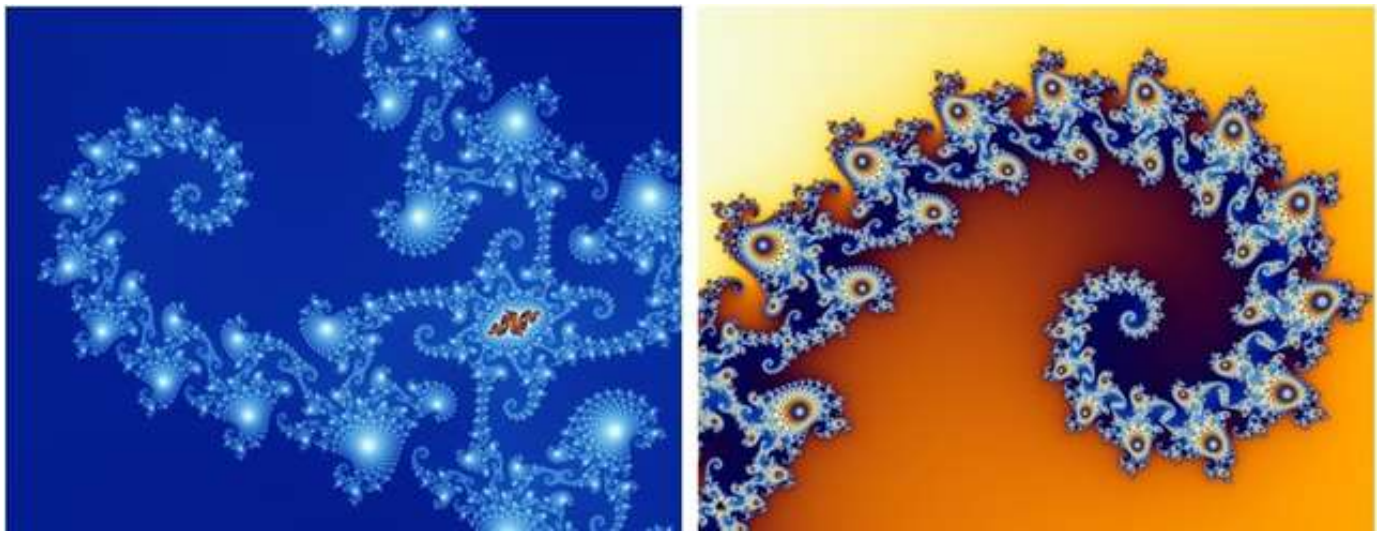
[58] Mandelbrot B (1982), *Fractal Geometry of Nature*, www.amazon.it/dp/0716711869/

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 a recursive function, an attractor (an operator

which tends to a limit). Complex shapes, and at the same time ordered, are obtained when an attractor is inserted.

Fractal geometry reproduces some of the most important structures of living systems, and many researchers have concluded that life follows fractal geometry: the outline of a leaf, the growth of corals, the form of the brain and the nervous terminations.



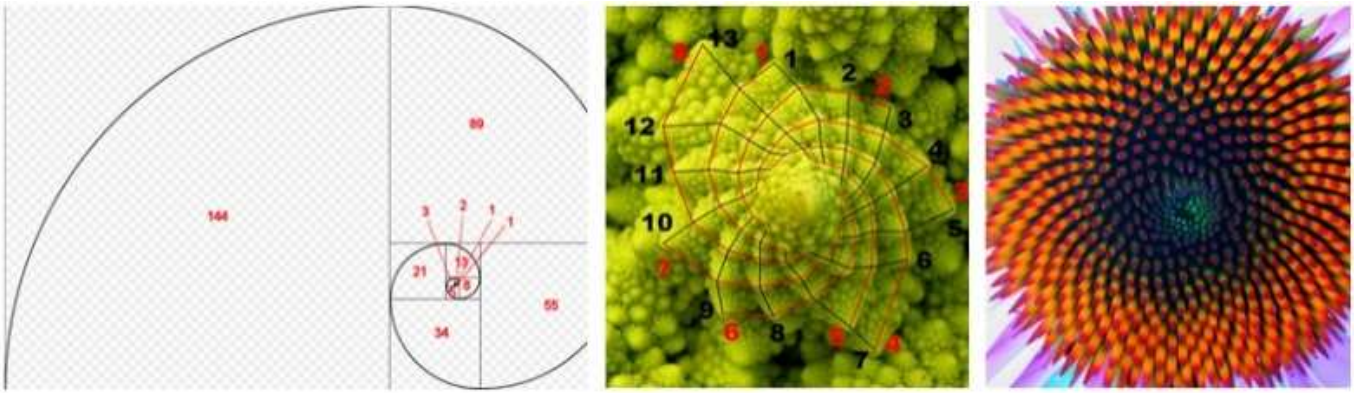
Fractal images

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 contraction 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 have led to 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.

Even before Leonardo da Vinci was exploring the fractal nature of rivers, trees and blood vessels, another Leonardo - named Leonardo of Pisa - was exploring fractal patterns in arithmetic. His book "*Liber Abaci*," published in the year 1202, under the penname 'Fibonacci', was significant in the history of mathematics because

it introduced the use of Arabic numerals into Europe, which would replace Roman numerals. Fibonacci described a sequence of numbers that would come to be called Fibonacci Numbers.



This sequence, which Fibonacci called *Modus Indorum*, method of the Indians, solved, a problem involving the growth of a population of rabbits based on idealized assumptions. In the Fibonacci sequence of numbers, each number is the sum of the

previous two numbers. Fibonacci ratio of consecutive numbers is known as the *golden ratio*.

Michelangelo used to state that the skill of an artist is to bring out from stone the figure that is already in it and does not belong to it. Similarly, the success of living species is to bring out the attractor which is already present in them, but which does not belong to their body. This explains the incredible stability of species and their convergence towards common forms, and the strange results obtained by Driesch with sea urchins' embryos.

Long before Darwin published *The Origin of Species*, scholars were divided in two main currents of thought. On

the one hand, some envisioned a dynamic and constantly changing nature, on the other hand others believed in a substantially unchanging nature. The first group included scientists and philosophers of the Age of Enlightenment, a cultural movement of intellectuals in 18th century Europe and the United States, whose purpose was to reform society and advance knowledge and promote science and intellectual interchange. The second group included scientists and philosophers close to the theory of fixity which the scientist Linnaeus proposed. This second group was rooted in the biblical Genesis and the Aristotelian philosophy, and believed that the various species and entities

had been created once and for all and were unable to change if not within certain limits.

The debate between these two groups is still going on: the first group is named *evolutionists* and claims that life and its various forms have emerged gradually because of random processes of mutation and natural selection that required millions of years, whereas the second group named *creationists* believes that life in its main forms was originated instantaneously, some thousand years ago, through the act of God.

Strong of the fact that the simplest protein would not form by the effect of chance, creationists argue that evolutionists are wrong. Similarly,

evolutionist argue that creationists are wrong since, if life was created by God, the action of entropy would lead this creation to death.

The evolutionist approach is based on the work of Charles Darwin (1809-1882) and assumes that all primates (including humans) descend from a common ancestor. According to Darwin, a gradual and continuous accumulation of successive mutations takes place, which in a period sufficiently long produces significant and advantageous changes in living organisms. This process is based on genetic transfer of information to offspring and on random mutations. Although changes between one generation and the next are generally

small, their accumulation over time would result in substantial transformations through the phenomena of natural selection and genetic drift and the emergence of new species. Darwin's theory found support in the laws of Mendelian inheritance of characters, and in the discovery of DNA.

A third group is named Intelligent Design (ID). The ID assumption is that Darwin's theory of evolution is unable to explain macroevolution, that is the formation of progressively more complex structures, and suggests the introduction in science of intelligent causality. While the creationists refer to sacred texts, ID is based on empirical evidence and

assesses whether these can be attributed to chance or require an intelligent cause. The conclusions which are reached cannot, however, justify the existence of a divine being, a creator. Furthermore, ID does not deny the theory of evolution, but it confines it within the boundaries of microevolution, i.e., the evolution by subtraction of features. However, ID does not explain macroevolution, it only states that a different type of causality is required.

Will the entropy syntropy hypothesis give rise to a fourth group?

The additional mass of life

Syntropy is cohesive. This fact explains the binding properties of living systems, but it also suggests an interaction between life energy and gravitation, since they both follow the same law of attraction.

Given these premises, the hypothesis arises that an additional mass associated to life should be observable.

The mass of a living organism (ML) would be the sum of the mass of the dead organism (MD), plus the mass due to the cohesive force of life energy: syntropy (MS).

$$ML = MD + MS$$

The idea that at death there is a loss of weight can be traced back to the 1901 experiments of Duncan MacDouglass, which were based on the idea that the "soul" has a mass.

MacDouglass idea was reinforced by the 2003 fictional movie titled "*21 grams*". The title refers to Duncan MacDougall results which show a loss of body weight, immediately following death, of approximately three-fourths of an ounce, since then popularized as 21 grams. MacDougall's results were published in the peer reviewed journal American Medicine.

The syntropy hypothesis considers life energy to be immaterial, whereas

MacDouglass believed the soul to have a mass. But since backward-in-time energy is cohesive, a living body can exert a stronger gravitational attraction, and therefore result to have a higher weight.

Duncan results have been replicated using closed system. Amrit Sorli describes these experiments in the paper "*The Additional Mass of Life*."[59] Preliminary experiments were carried out at the Bio-technical Faculty, Ljubljana, Slovenia, in June 1987 using test-tubes which were filled with three milliliters of water solution mixed with meat and sugar. Fungus were added into half of the test-tubes

[59] Sorli A (2004), *The Additional Mass of Life*, Journal of Theoretics, 4:2, www.journaloftheoretics.com/articles/4-2/Sorli-final.htm

and all test tubes were welded airtight. The weight difference between test-tubes was measured for ten days. After three days of growth, the weight of test tubes with the fungus increased and in the last seven days remained unchanged. These experiments were repeated in 1988 at the Faculty for Natural Science and Technology, Ljubljana, and identical results were obtained.

In another experiment, a test-tube was filled with 70 grams of live Californian worms and a small test-tube was filled with 0.25 ml of 36% water solution of formaldehyde. The control test tube contained 70 ml of distilled water with a small test tube of formaldehyde inside. Both test tubes

were welded and one hour was allowed for acclimatization. Test-tubes were then weighted at intervals of five minutes. Then they were turned upside down to spill the solution of formaldehyde and again they were measured at intervals of fifteen minutes. The weight of the test-tubes with the poison was found to have increased in the first 3 minutes after the poisoning, for an average weight of 60 micrograms and it then went down. Fifteen minutes after poisoning, the weight diminished, on average by 93.6 micrograms. This experiment was repeated several times obtaining always similar results. Independent researchers have reproduced similar

results. It is interesting to note that after poisoning, but before death occurs, an increase in weight is reported. This can be interpreted as an increase in syntropy, in the attempt of the attractor to keep the system alive. An increase in syntropy results in an increase of cohesive forces and consequently of weight.

In the hypothesis that the interaction between life energy and gravitational forces is true, a wide range of applications can be imagined. For example, vital parameters of an organism (such as heart rate and skin conductance in human beings) could be used to anticipate gravitational changes. Living systems with no or simple cortical systems, which mainly

react in an instinctual way directly guided by the attractor, should show stronger anticipatory reactions in their vital parameters.

The belief that animals can predict earthquakes has been around for centuries. Accounts date back to 373 B.C., when animals, including rats, snakes, and weasels, abandoned the Greek city of Helice, just days before a quake devastated the place. Cats and dogs showing signs of nervousness and restlessness, catfish moving violently, chickens that stop laying eggs, bees leaving their hive in a panic, are continuously reported before earthquakes.

Based on the observation of these strange behavior of animals, in 1975

Chinese officials ordered the evacuation of Haicheng, a city with one million people, just days before a 7.3-magnitude quake. Only a small portion of the population was hurt or killed. If the city had not been evacuated, it is estimated that the number of fatalities could have exceeded 150,000.

But mainstream science still rejects the idea that anticipatory reactions can exist.

THE COMPASS OF THE HEART

The autonomic nervous system automatically and unconsciously regulates the vital functions of the body, without the need for any voluntary control.

Almost all the visceral functions are under the control of the autonomic nervous system which is divided into the sympathetic and parasympathetic systems. The nerve fibers of these systems do not directly reach the organs but stop first and form synapses with other neurons in structures called ganglia, from which

other nerve fibers form systems, called plexuses, which reach the organs. The sympathetic part of the system is close to the spinal ganglia and forms synapses together with longitudinal fibers, in a tree called the paravertebral chain. The parasympathetic system forms synapses away from the spine and closer to the organs it controls. The ganglia of the sympathetic system are distributed as follows: 3 pairs of intracranial ganglia, located along the trigeminal, 3 pairs of cervical ganglia connected to the heart; 12 pairs of dorsal ganglia connected to the lungs and the solar plexus, 4 pairs of lumbar ganglia that are connected through the solar plexus to the stomach, small

intestine, liver, pancreas and kidneys, 4 pairs of ganglia in connection with the rectum, bladder and genital organs.

For a long time, it was believed that there was no relationship between the brain and the sympathetic system, but today we know that this relationship exists, is strong and that the brain can act directly on the organs through the mediation of the solar plexus. There is therefore a link between mental states and physical states. For example, sadness acts on the solar plexus through the sympathetic system, generating a vasoconstriction due to the contraction of the arterial system. This contraction caused by sadness

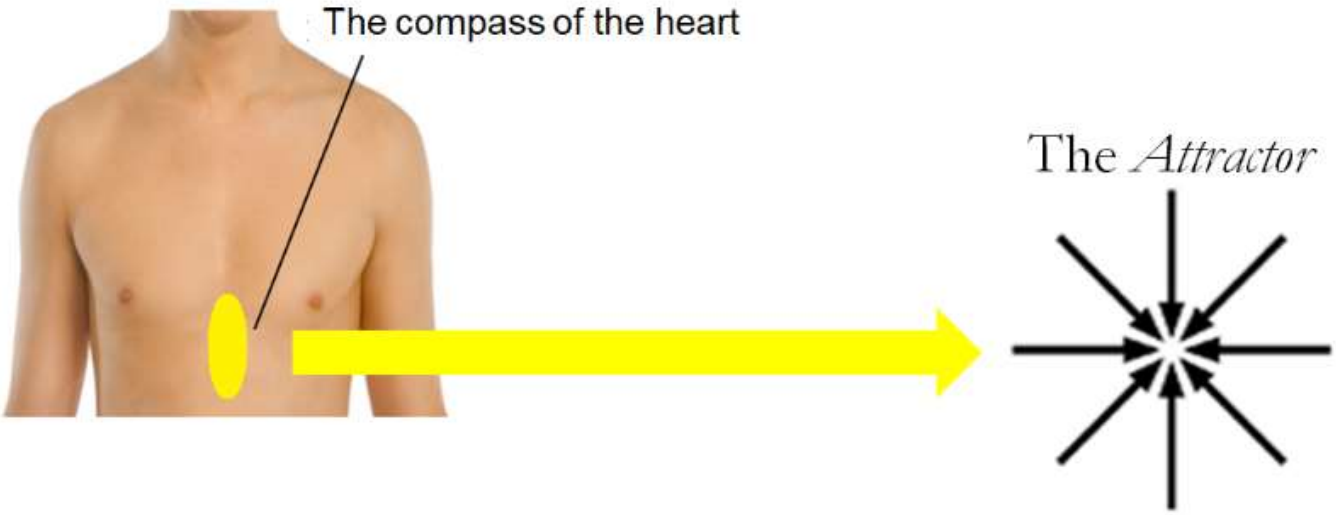
hinders blood circulation, thus also affecting digestion and respiration.

People commonly refer to the heart and not to the solar plexus. However, from a physiological point of view, the organ that allows us to perceive our feelings is the solar plexus.

Syntropy nourishes the vital functions and is a converging energy that propagates from the future, consequently when the inflow of syntropy is good we feel warmth (i.e., energy concentration) and well-being in the thoracic area of the autonomic nervous system.

On the contrary, when the inflow is insufficient, we feel emptiness, pain and anxiety.

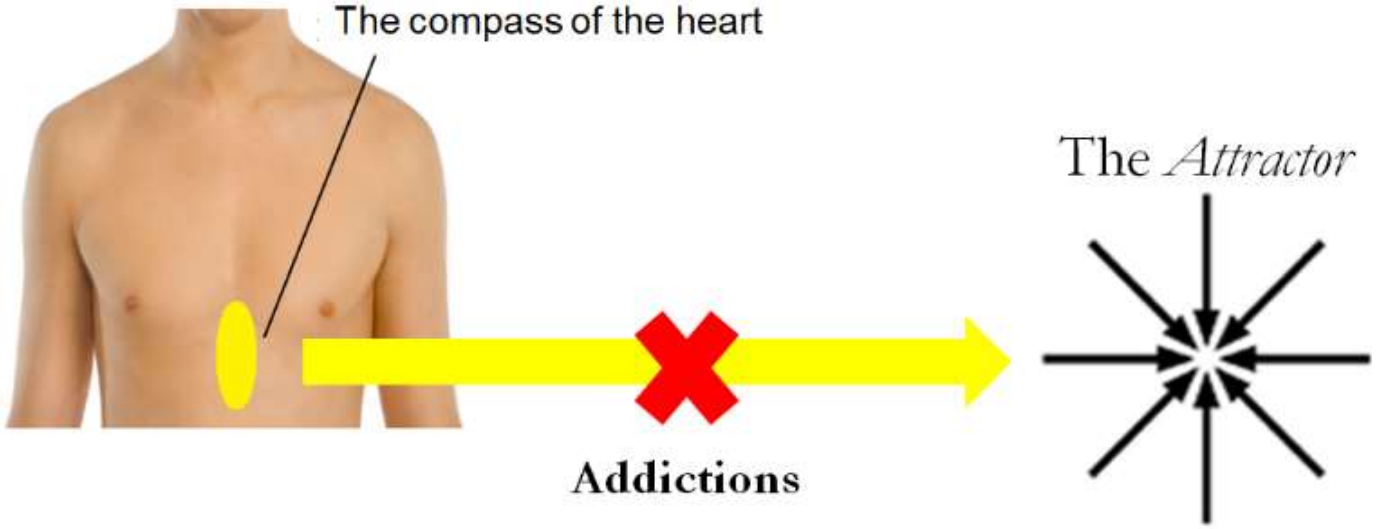
These sensations work like the needle of a compass which points towards the source of syntropy (ie life energy).



Unfortunately, most people are unaware of how the compass of the heart works and their main concern is to avoid suffering and the unbearable feeling of anxiety. This explains, for example, the mechanism of drug addiction. Substances that act on the autonomic nervous system, such as

alcohol and heroin, causing feelings of warmth and wellbeing similar to those that we experience when there is a good inflow of syntropy, can soon become vital.

The compass of the heart points to the source of syntropy, but drugs, alcohol and whatever we use to sedate our suffering reduces our possibility to use the compass of the heart and chose what is beneficial for life.



To improve the flow of syntropy and promote wellbeing it is therefore essential to abandon any kind of addiction.

While the brain is made of gray matter outside and white matter inside, exactly the opposite is observed in the solar plexus. The gray matter is made up of nerve cells that allow us to think, the white matter is made of nerve fibers, cell extensions, which allow us to feel.

The solar plexus and the brain are the opposite of each other and represent two polarities: the emitter pole and the absorber pole. The same duality that is found between entropy and syntropy.

The solar plexus and the brain are closely connected and from a phylogenetic perspective the brain has developed from the solar plexus. Between the brain and the solar plexus there is a specialization of functions that are completely different and that can only occur when these two polarities are integrated and work in harmony, producing results that are quite extraordinary.

Experiments show that syntropy acts mainly on the solar plexus and is perceived as warmth and well-being. On the contrary, the lack of syntropy is perceived as emptiness and suffering.

Since syntropy propagates backwards in time, feelings of warmth and emptiness help us feel the future and orient our choices towards advantageous goals. The following examples provide some insights into the implications of this backward in time flow:

– The article "*In Battle, Hunches Prove to be Valuable*", published on the front page of the New York Times on July 28, 2009, describes how experiences associated with intuitions and premonitions helped soldiers save themselves: "*My body suddenly became cold; you know, that feeling of danger, and I started screaming*

no-no!" According to syntropy, the attack happens, the soldier experiences fear and death and these feelings of distress propagate backward in time. The soldier in the past feels these as premonitions and is driven to take a different decision, thus avoiding the attack and death. According to the New York Times article, these premonitions have saved more lives than the billions of dollars spent on intelligence.

– William Cox conducted studies on the number of tickets sold in the United States for commuter trains between 1950 and 1955 and found that in the 28 cases where

commuter trains had accidents, fewer tickets were sold[60]. Data analysis was repeated verifying all possible intervening variables, such as bad weather conditions, departure times, day of the week, etc. But no intervening variable was able to explain the correlation between reduced ticket sales and accidents. The reduction of passengers on trains that have accidents is strong, not only from a statistical point of view, but also from a quantitative point of view. According to syntropy, Cox's discoveries can be explained in this way: when people are involved in

[60] Cox, W.E., *Precognition: An analysis*. Journal of the American Society for Psychical Research, 1956(50): 99-109.

accidents, the feelings of pain and fear propagate backward in time and can be felt in the past in the form of presentiments and premonitions, which can lead to the decision not to travel. This propagation of feelings can therefore change the past. In other words, a negative event occurs in the future and informs us in the past, through our feelings. Listening to these feelings can help us decide differently and avoid pain and suffering in our future. If we listen to the inner voice, the future can change for the better.

– Among many possible examples: on May 22, 2010, an Air India

Express Boeing 737-800 flying between Dubai and Mangalore crashed during landing, killing 158 passengers, only eight survived the accident. Nine passengers, after check-in, felt sick and could not get on board.

In this regard, the neurologist Antonio Damasio, who has studied people affected by decision-making deficits, discovered that feelings contribute to the decision-making process and make advantageous choices possible without having to make advantageous evaluations.[61]

Damasio observed that cognitive

[61] Damasio, A.R., *Descarte's Error. Emotion, Reason, and the Human Brain*, Putnam Publishing, 1994.

processes were added to emotional ones, maintaining the centrality of emotions in the decision-making process. This is evident in times of danger: when choices must be made quickly reason is bypassed.

People with decision making deficit show knowledge but not feelings. Their cognitive functions are intact, but not the emotional ones. They have normal intellect but are unable to make appropriate decisions. A dissociation between rationality and decision-making skills is observed. The alteration of feelings causes a myopia towards the future. This may be due to neurological lesions or to the use of substances, such as alcohol

and heroin, which reduce the perception of our feelings.

Feelings of warmth point to the path that leads to well-being and to what is beneficial to life. It is therefore good to choose according to these feelings.

When we converge towards the attractor feelings of warmth inform that we are on the right path, on the contrary when we diverge, we feel void and anxiety.

Intuitions arise from the ability to feel the future and are based on feelings not contaminated by drugs, alcohol, habits and fears.

Henri Poincaré, one of the most creative mathematicians of the last century, observed that when faced with a new problem whose solutions

can be countless, a rational approach is initially used, but being unable to arrive at the result another type of process is activated.

This process selects the correct solution among the endless possibilities, without the help of rationality.

Poincaré called it intuition (combining the Latin words *in*=inside + *tueri*=glance), and was struck by the fact that they are always accompanied by experiences of truth, beauty, warmth, and well-being in the thoracic area:[62]

"Among the large number of possible

[62] Henri Poincaré, Mathematical Creation, from Science et méthode, 1908.

combinations, almost all are without interest or utility. Only those that lead to solving the problem are illuminated by an interior experience of truth and beauty."

For Poincaré, intuitions require attention and sensitivity to these feelings of truth and beauty, which connect us to the future, to the intelligence of syntropy.

Robert Rosen (1934-1998), theoretical biologist and professor of biophysics at the Dalhousie University, in his book *Anticipatory Systems*[63] wrote:

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[63] Rosen, R., *Anticipatory Systems*, Pergamon Press, USA 1985.

"I was amazed by the number of anticipatory behaviors observed at all levels of the organization of living systems (...) that behave like real anticipatory systems, systems in which the present state changes according to future states, violating the law of causality according to which changes depend exclusively on past or present causes. We try to explain these behaviors with theories and models that exclude any possibility of anticipation. Without exception, all biological theories and models are classic in the sense that they seek only causes in the past or present."

To make anticipatory behaviors consistent with the idea that causes must always precede effects, predictive models and learning processes are considered. But

anticipatory behaviors are found also in the simpler forms of life, such as cells, without neural systems, and in these cases, it is difficult to sustain the hypothesis of predictive models or learning processes. Furthermore, they are also observed in macromolecules, and this excludes any possible explanation based on innate processes due to natural selection. Rosen concludes that a new law of causality is needed to explain the anticipatory behaviors of living systems.

Syntropy states that life depends on the future and that it continually manifests retrocausal behaviors of anticipation.

A very important example was provided by Steve Jobs, the founder of Apple Computer.

Steve Jobs had been abandoned by his natural parents and this was the drama that accompanied him throughout his life. He was tormented and never accepted being abandoned.

He left university during the first year and ventured to India to find his inner self.

He discovered a completely different vision of the world that marked his change:

"*In the Indian countryside people do not let themselves be guided by rationality, as we do, but by intuitions.*"

He discovered intuitions, a very powerful faculty, very developed in India, but practically unknown in the West.

He returned to the United States convinced that intuitions were more powerful than intellect. To cultivate intuitions, it was necessary to live a minimalist life, reducing entropy as much as possible. He became a vegan, refused alcohol, tobacco, and coffee, began to practice Zen meditation, and had the courage not to be influenced by the judgment of others.

He always tried to reduce entropy to the point that it took him more than 8 months to choose the washing machine. He absolutely had to find the one with the lowest energy

consumption and maximum efficiency. He lived in a thrifty way, a life so essential and austere that led his children to believe he was poor.

The way he lived was the result of his need to focus on the heart, on inner feelings. He avoided wealth because it could distract him from the voice of the heart. He was one of the richest men on the planet, but he lived like a poor man! From a syntropic perspective, his minimalist choices allowed intuitions to emerge, becoming the source of his innovations and wealth.

Jobs opposed marketing studies, as he said that people don't know the future. Only intuitive people can feel the future.

When he returned from India he saw an electronic board at his friend Steve Wozniak's house and he had the intuition of a computer that could be held in one hand. He asked Wozniak to develop a prototype of a personal computer, which he named Apple I. He managed to sell a few hundred and this sudden success gave him the impetus to develop a more advanced model, suitable for ordinary people, which he called Apple II.

Jobs was not an engineer, he had no scientific or technical mind, he was simply an artist! What do computers have to do with his life? Jobs had nothing to do with electronics, but his intuitive abilities showed him a goal, an object of the future. Thirty years

earlier, in 1977, he had sensed a pocket computer that combines aesthetics, simplicity, technology and minimalism! He felt the need for a product that, in addition to being technologically perfect, had to be also beautiful and simple!

His obsession with beauty and simplicity led him to devote an enormous amount of time to the details of the Apple II. It had to be beautiful, silent and at the same time essential and simple! It was an unprecedented commercial success that made Apple Computer one of the leading global companies.

Jobs noticed that when the heart gave him an intuition, it turned into a command he had to follow, regardless

of the opinions of others. The only thing that mattered was finding a way to give shape to the intuition.

For Jobs, the vegan diet, Zen meditation, a life immersed in nature, abstention from alcohol and coffee were necessary to nourish his inner voice, the voice of his heart and strengthen his ability to intuit the future.

At the same time, this caused great difficulties. He was sensitive, intuitive, irrational, and nervous. He was aware of the limitations that his irrationality caused him in handling a large company, such as Apple Computer, and chose a rationalist manager to run the company: John Sculley, a famous manager he admired but with whom

he entered continually in conflict, to the point that in 1985 the board of directors decided to fire Jobs from Apple, the company he had founded.

Apple Computer continued to make money for a while with the products designed by Jobs, but after a few years the decline began and in the mid-1990s it came to the brink of bankruptcy. On December 21, 1996, the board of directors asked Jobs to return as the president's personal advisor. Jobs accepted. He asked for a salary of one dollar a year in exchange for the guarantee that his insights, even if crazy, were accepted unconditionally. In a few months he revolutionized the products and on September 16, 1997, he became

interim CEO.

Apple Computer resurrected in less than a year. How did he do it?

He said we should not let the noise of others' opinions dull our inner voice. And, more importantly, he repeated that we must always have the courage to believe in our heart and in our intuitions, because they already know the future and know where we need to go. For Jobs, everything else was secondary.

Being interim has marked all his new products. Their name had to be preceded by the letter *i*: *i*Pod, *i*Pad, *i*Phone and *i*Mac.

Jobs's children believed he was poor. They often asked him:

"*Daddy, why don't you take us to one of*

your rich friends?"

He talked about important business walking in parks or in nature. To celebrate a success, he invited employees to restaurants for $10 per person. When he made a gift, he collected flowers in a field. He wore the same clothes for years. Despite the immense riches he had!

He was convinced that money was not his, but that it was a tool to reach the end.

At the time of Apple I, he repeated that his mission was to develop a computer that could be held in one hand and not to get rich. For him money was exclusively a tool.

The ability to feel the future was the source of Jobs' wealth. It was the

ingredient of his creativity, genius, and innovation.

Zen meditation helped Jobs calm his mind and move the attention to the heart.

In his lectures he used to say that almost everything, expectations, pride, and fears of failure, vanish in the face of death. He emphasized the centrality of death and the fact that when we are aware of dying, we pay attention only to what is important. Being constantly aware that we are destined to die is one of the most effective ways to understand what is important and to avoid the trap of attaching ourselves to materiality and appearance. We are already naked in the face of death. Since we must die,

there is no reason not to follow our heart and do what we must do.

Jobs believed in the invisible and in synchronicities. He built the headquarters of Pixar (one of his companies) around a central space, a large square where everyone had to go through or stop if they wanted to eat something or use the services. In this way the invisible world was favored by chance encounters.

According to Jobs, chance does not exist. Chance encounters allow the invisible, to activate intuitions, creativity and synchronicities and make visible what is not yet visible.

Jobs loved to quote Michelangelo's famous phrase:

"In each block of marble, I see a statue as if it were in front of me, shaped and perfect in attitude and action. I just have to remove the rough walls that imprison the beautiful appearance to reveal it to others as my eyes see it."

Jobs believed that we all have a task, a mission to carry out. We just need to discover this mission by removing what is not necessary.

Jobs made visible what he had intuited. He died a few months after the presentation of the *i*Pad, the computer that can be held in one hand, the mission of his life.

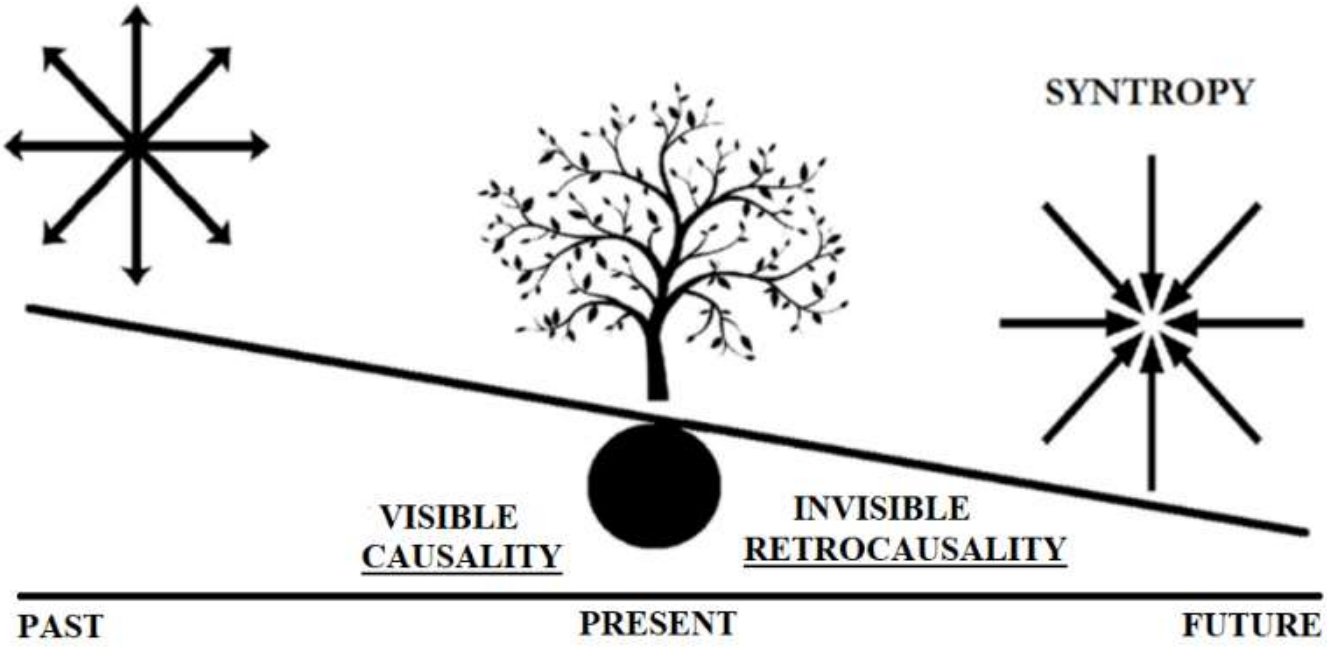
The life of Jobs testifies that intelligence and creativity come from the future, from the invisible and that

we can access the invisible through intuitions.

He showed that the voice of the heart brings the future into the present. Rainer Maria Rilke said: "*The future enters us, to become us, long before it happens.*"

Now let's move on to another example.

The complementarity between entropy and syntropy can be represented as a seesaw with causality on one side and retrocausality on the other.



Life is the manifestation on the physical plane of syntropy. It is constantly in conflict with entropy and must always diminish it. However, this is hampered by our activities that tend to increase entropy.

The challenge of life is: *how to increase syntropy and reduce entropy by remaining active?*

To describe this challenge, I will use the example of a freelance, single, whose expenses exceeded the income of over five hundred euros a month.

The savings were running out and he had no one to ask for help. He started reducing his expenses: no money in his wallet, no credit on his cell phone. But things went from bad to worse. At this point he asked me for help.

Let's see how it went:

«*How much do you spend on your mobile phone?*»

«*About 40 euros a month, but I always find myself without credit.*»

«*Why don't you change provider? There are interesting promotions. With only 10 euros a month you can have unlimited minutes and*

SMS and 20 gigabytes of internet.»

Lowering entropy means saving, but this must be done by maintaining or increasing the quality of life. For example, by changing an old contract. In this case, changing provider and choosing a new contract has led to an increase in the quality of life and to save over three hundred euros a year!

The trick is to improve the quality of life by saving.

When entropy (expenses) and syntropy (incomes) are balanced, the invisible world begins to manifest.

In this example we need to reduce spending by at least six thousand euros a year.

«Do you take shirts to the laundry to be ironed?»

«I wash them, but I am not able to iron them. I take them to the laundry to have them ironed.»

«How much does it cost you?»

«Between 50 and 70 euros a month.»

«Why don't you ask your maid if she can iron them for 8 euros more per month?»

The maid immediately accepted. Another small optimization that led to save over six hundred euros a year, but which significantly increased the quality of life by eliminating the hassle of going to the laundry. Again an increase in the quality of life while saving! These first two optimizations reduced entropy by around one

thousand euros a year and increased the quality of life. The goal is to reach six thousand euros to balance income and expenses.

«*Do you go to work by car?*»

«*I also use the scooter to save money, but the traffic is really dangerous!*»

«*Why don't you use your bicycle?*»

«*On these roads ?!*»

«*No, on alternative roads.*»

«*My house is in the city center, the office is not far away, but I have always considered the bicycle impossible due to the difference in altitude of over 30 meters. I would arrive tired and sweaty.*»

«*If you have to climb it is better to choose a steep but short road, get off and push, rather than pedaling.*»

Thus he discovered the beauty of the streets of the city center and parks. In less than 25 minutes he could reach his office by bicycle. It took more time by car or scooter. The next day he sold the scooter, canceled the insurance and the garage. In total, another three thousand euros saved per year. With this simple optimization, he has received other advantages: he exercises and no longer needs to go to the gym, more money and time saved! Moreover, he spends less on fuel.

Entropy has now decreased by over four thousand euros a year and the quality of life has improved!

We need to find another two

thousand euros before syntropy, the invisible world can begin to show.

«*Your electricity bill exceeds 200 euros every two months! As a single you should not pay more than 50 euros.*»
«*What should I do?*»
«*Try using low energy light bulbs, such as LED lamps, and set the timer to the water heater.*»

Small changes that required little time and money. One hundred and fifty euros saved every two months, nine hundred euros a year. With this small optimization he felt consistent with his ecological beliefs and the quality of life increased. Now he had reduced his expenses by over five

thousand euros a year! We must reach the goal of six thousand euros a year!

«*How much do you pay for electricity in your office?*»
«*About 300 euros every two months.*»
«*Do you use halogen bulbs !?*»
«*Yes.*»

He discovered that he could save over a thousand euros a year simply by replacing the halogen spotlights with LED spotlights.

Now that the expenses no longer exceed the incomes, syntropy can begin to show itself in the form of synchronicities: meaningful coincidences.

Jung and Pauli have coined the term synchronicity to indicate an invisible causality different from that familiar to us. Synchronicities manifest as meaningful coincidences because they converge towards an end.

Invisible causality acts from the future and groups events according to purpose. Synchronicities are significant because they have a purpose.

«*How much do you pay for renting your office?*»

«*Nothing. It is owned by my aunts.*»

«*They could rent it and make a profit, but you use it for free ?!*»

«*Exactly.*»

«*And what are your aunts living on?*»

«They both receive a pension and have some savings, but their financial situation is not good, they constantly complain.»

«Have you ever thought about renting a room in an office and letting your aunts rent their apartment?»

«I have no money, I can't afford to pay a rent!»

«How's your business going?»

«I have few clients, perhaps because of the economic crisis, but also because of the position of the office.»

«A less prestigious office, but in a strategic and well-connected place could help you have more customers ?!»

The first synchronicity is the following. The day after this dialogue, as if by magic, he received the offer of

a room in an office in the most central area of the city, at the price of only 250 euros a month, including all utilities! The aunts' apartment was in a very beautiful and prestigious place, but difficult to reach and there was no parking: beautiful, prestigious, but inconvenient and very expensive. However, he hesitated, he didn't dare!

The next day another synchronicity occurred. He received a call from the doorkeeper. An airline offered 2,800 euros a month for his aunts' apartment. Obviously, the aunts asked him to find another place immediately and fortunately the day before he had received the offer of a room. But he still wasn't convinced. The office in the city center was in a

very noisy area: well-connected, but chaotic.

The third synchronicity is the following. That same afternoon he was walking in the part of the city he likes most. It is not central, but it is green, quiet, and well connected. At a shoemaker's window, he saw a notice for a room in an office. The apartment was in the building next to the shoemaker. He called and immediately went to see it. He instantly decided to rent the room. In a city like Rome, it is difficult to find rooms for rent in professional studios and above all in such a beautiful place of the city.

When synchronicities are activated, we are attracted to places and

situations that otherwise we would not have taken into consideration and that solve our problems. Synchronicities are accompanied by feelings of warmth and well-being in the thoracic area that inform us that we are on the right path.

«*I began to feel warmth and well-being in the chest area. My clients like the new studio. There is a parking lot, it is nice, quiet and it is located near a metro station. My business is thriving, my savings are increasing and my personal and sentimental life has improved.*»

Syntropy offers wealth and happiness. But when things go well it is easy to fall back into the old entropic and dissipative lifestyles.

A few months later he received a job offer, a prestigious job abroad: his dream!

He immediately accepted and moved. The salary was high, taxation was low. Suddenly he would become a rich man who could lead the rich life he had always wanted.

But this reverses the balance between entropy and syntropy: wealth leads to living in an entropic way, entropy increases and syntropy decreases and we go back to failure!

«*The foreign company was only interested in making money, without any ethics. I had to work almost fifty hours a week, there was nothing else outside the company. It was necessary to give absolute priority to what was*

profitable, even if immoral. A few months later I felt disgusted with my profession. Taxes were low, but I had to pay all the services. By adding the rent of the house and the expenses related to the fact that I was a foreigner, I paid much more than I earned. After only six months I had accumulated more than twenty-eight thousand euros of debts! The dream had broken and had become a nightmare. From heaven I fell to hell. I had no time for myself or for my love life. First, I felt discomfort, then suffering, and eventually depression and anxiety exploded. I decided to go back to Italy!»

This often happens. Syntropy increases the quality of life, well-being, but also wealth. As soon as material wealth returns people fall

into entropic lifestyles.

For this reason, the increase in syntropy must be accompanied by an inner transformation. People do not have to consider money as their property, but as a tool. They must be aware that happiness is not achieved through wealth, but thanks to the fulfillment of our mission.

If this inner transformation is lacking, the process fails.

Material improvements must be accompanied by a new awareness of the invisible.

Wealth is only one aspect of the game between entropy and syntropy. When wealth is reached without an inner transformation it is inevitable to fall back into entropy and suffering.

This game between entropy and syntropy involves not only individuals, but also companies, institutions, and nations. It can be used successfully in the management of cities, nations, public and private organizations, and ecological and natural systems. But it must always be accompanied by an inner transformation that puts the heart at the center of decision-making, otherwise it will inevitably lead to failure.

The compass of the heart is of great importance in the game of life, but since in the same area we perceive emotions linked to fear and danger it is not easy to use.

These emotions are activated by the

amygdala.

The amygdala is designed to ensure survival. When we are faced with a danger it releases hormones that trigger the fight or flee reaction. The amygdala is fast, but inflexible. The emotional charge enters our body and covers the feelings of the heart.

Fears and dangers limit the ability to use the compass of the heart and increase entropy.

The compass of the heart requires that we silence fear and the chatter of the mind.

A very effective way is provided by Zen meditation.

During Zen meditation participants cannot react to stimuli, but they can only observe them. Practicing Zen

meditation, we discover that thoughts wait for the reaction of the heart. When the heart reacts, it provides energy to the thought which becomes stronger. When we don't react the thought dissolves.

The heart decides when to react and to be silent; the mind can only adjust to the will of the heart. We are the heart. Our will is in the heart. In this way the scepter of command moves from the head to the heart and the mind becomes silent.

The importance of silence can be found in many traditions. The groups of Friends (also known as Quakers) started practicing silence in 1650 when George Fox discovered that it restores the flow of the energy and a

direct contact with Deity. The practice is simple, people sit in a circle and are silent for about an hour. Shared silence helps to feel the heart.

Silence is a natural technique, a simple and enjoyable way of being together with others. It is not a religion and does not require devotion to a faith, or to a specific philosophy. It creates distance from our thoughts. It frees our being from the conditioning power of the words and leads to discover that we are part of something broader. When the chatter of the mind ends, we experience a new condition: to be without thinking. A state in which thoughts are produced only when required by the heart. A state in which the gap between a

thought and the other is not empty, but it is pure and absolute potentiality. Being without thinking empowers the heart: our true will.

Another factor which influences the perception of the heart is what we eat.

John Hubert Brocklesby became a vegetarian in prison during the First World War. For him, Christians did not have to kill other Christians and declared himself a conscientious objector. He was arrested and imprisoned in the Richmond Castle. He had to face court martial. He knew he would be sentenced to death, and he was terrified at the idea.

Another conscientious objector told him: «*If you talk with your heart it is God who speaks through you.*» This gave him

courage. Then this conscientious objector added: «*If you do not eat meat, the voice of the heart becomes stronger*.»

John Hubert Brocklesby became a vegetarian in prison to serve the will of God and face court martial.

A book was written using his diaries.[64]

Since we have a vegetarian structure (no claws to hunt, teeth suitable for fruit and a long digestive system not meant for meat) the attractor towards which we are converging has these features. Therefore, being vegetarian helps the connection with the attractor, increasing the flow of syntropy and the feelings of the heart.

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[64] Jones WE, *We Will Not Fight: The Untold Story of World War Ones Conscientious Objectors*, www.amazon.com/dp/1845133005/

This last consideration is supported by an epidemiological study conducted by the Canadian Natural Hygiene Society on the risk of heart attacks that shows that meat eaters have a 50% risk, vegetarians 15%, vegans 4%.

Among the diet options that seem to increase the perception of the heart one is liquidarism.

Michael Werner, born in 1949 in northern Germany and CEO of a pharmaceutical research institute in Arlesheim, became liquidarian in January 2001 and since then drinks only water and does not eat solid food. In his book *Living on Light* Werner says that:

"I found that my conversion to living without food went extraordinarily well. I expected to feel weaker and weaker during the first few days. But then I began to realize that in my case this weakness did not exist. Instead, I experienced a growing feeling of lightness during the day and a decrease in the amount of sleep I needed during the night. Going through this process was probably the most intense experience of my adult life."

If it is true that one can live and be fit and healthy without eating, incredible scenarios open about human life and life in general.

Werner notes that being liquidarian is different from fasting:

"It is something completely different! With fasting the body mobilizes reserves of energy and matter and one cannot fast for an unlimited time, nor can one be without drinking. But the process I was undertaking was and remains a mental-spiritual phenomenon that requires a particular inner predisposition. There is a condition: opening up to the idea of being able to be nourished by the etheric, by prana or by whatever it may be called. This is the necessary requirement. Then it will happen. I live liquidarism as a gift from the spiritual world."

Rudolf Steiner (1861-1925), Austrian philosopher, social reformer, architect and esotericist, attempted to formulate a spiritual science, a synthesis between science and

spirituality that applied the clarity of scientific thought, of Western philosophy, to the spiritual world. Steiner believed that matter was condensed light (he used the word light with the same meaning of syntropy). If matter is condensed syntropy, there must be many ways to transform the invisible (syntropy) into matter. Our visible environment is immersed in an invisible environment, a syntropic reality that offers incredible possibilities, including that of living from syntropy. Steiner believed that life was impossible without syntropy (ie without light), since syntropy is the vital energy that we continuously and directly absorb. To live only on water,

it is necessary to believe that it is possible to "*live by syntropy*." According to Steiner, the act of digesting stimulates the body to absorb the vital energy from the invisible, which is transformed and condensed into substance that maintains and builds our body. Steiner used the following example: when we eat a potato, we chew and digest and this leads to absorbing the vital forces from our etheric environment and condensing them into substances. In other words, our body acquires structure and substance absorbing syntropy and invisible forces.

Michael Werner emphasizes that the only prerequisite for feeding on light

(i.e., syntropy) is to trust it. He uses the words of Steiner:

"There is a fundamental essence of our earthly material existence from which all matter is produced through a process of condensation. What is the fundamental substance of our terrestrial existence? Spiritual science gives this answer: every substance on earth is condensed light! There is nothing but condensed light ... Wherever you touch a substance, there you have condensed light. All matter is, in essence, light."

In other words, all matter is nothing else but condensed syntropy!

But it is important to be careful.

Many people suggest fasting, nonetheless some techniques can be dangerous, as it is the case of Jasmuheen's breatharianism, a fast without food and liquids that has been lethal to various followers.[65]

[65] Di Corpo U., Liquidarism, Syntropy and Vital Needs: https://www.amazon.com/dp/1092909060

VITAL NEEDS

Water is the lifeblood that provides syntropy to life. Without water life is unable to counteract the destructive effects of entropy and dies. We can therefore list water among the vital needs.

Life also needs energy. This is why the Sun is so important. The chlorophyll process absorbs energy from the Sun and without the Sun life could not exist on this planet.

Life dies when water freezes. Heat is needed to keep life away from low temperatures.

Living systems are generally not able

to feed directly on syntropy. Therefore, they must meet conditions for the acquisition of food. These conditions are known as material needs.

When these needs are not met, alarm bells are activated, such as thirst for the need for water, hunger for food and chill for the need for heat.

These alarm bells are well known to all, we know how to associate them with the need that must be met, and we know what we must do.

But we also have invisible vital needs!!!

The *Attractor* is the source of syntropy and resides outside of our

physical body, connected to it through the solar plexus. It provides visions of the future, insights, inspirations, and higher levels of awareness, which are inaccessible to the ordinary states of the rational mind. It shows the direction, the goals and the mission of our life by acting as a teacher that guides us to the solution of problems and to well-being.

We establish the connection through the autonomic nervous system, the solar plexus, which we commonly associate with the heart.

This connection is easier and stronger in moments of meditation and love and when we abstain from the consumption of alcohol, tobacco,

drugs, and coffee and when we follow a vegetarian or liquidarian diet.

Since syntropy concentrates energy, a good connection is perceived as warmth and well-being in the solar plexus. On the contrary, a weak connection is signaled by feelings of emptiness and pain that we usually indicate as anxiety and by symptoms of the autonomic nervous system, such as nausea, dizziness, and suffocation.

Syntropy is needed to regenerate damaged cells and parts of the organism. The autonomic nervous system acts like a mechanic who consults the manufacturer's guide to carry out repairs and keeping the system as close as possible to the

design. However, the design is not mechanical, and the instructions are written with the ink of love.

The autonomic nervous system oversees all the involuntary functions of the body and is responsible for controlling the movement of muscles and limbs and regulates body functions that are not subject to decisions and that do not require the conscious mind. For example, it is responsible for digestion, heart rate, food assimilation and cells regeneration.

These processes are completely unknown to our conscious mind. We don't know how they are performed and often we don't even know they exist. We don't need to be a doctor or

a biologist to digest food or regenerate tissues. The body knows everything and shows an extraordinary level of intelligence. It directs and regulates these processes, thus expressing the capacity and potentials of an intelligence that is incredibly superior to our conscious mind.

It develops patterns of behavior that it then performs autonomously and automatically and that are maintained over time, giving rise to habits that are then stored, at least in part, in the muscles of the body. Behavioral patterns are repeated until they are activated automatically, regardless of our will. These patterns are then firmly placed in the memory of the

unconscious mind. The conscious mind often does not know what is in the memory of the unconscious mind. As a result, the unconscious mind can open incredible scenarios in the processes of knowing ourselves. The autonomic nervous system (i.e., the unconscious mind) also acts as a guardian of any information that the conscious mind cannot handle.

When the connection with the attractor is strong, we feel warmth, well-being and love, when it is weak we feel void, pain and anxiety accompanied by loneliness and isolation. In the absence of the connection the autonomic nervous system is not able to provide syntropy to the vital functions and the

organism dies.

We can therefore die not only because of unsatisfied material needs, but also because of the lack of connection with the attractor.

The need for connection with the attractor is usually perceived as a ***need for love*** and cohesion.

To respond to our needs, we build maps of the physical environment that lead to realize that we live in a world that has expanded towards infinity. On the contrary, consciousness concentrates towards the infinitely small.

The identity conflict arises from the comparison:

$$\frac{I}{Outside\ World} = 0$$

When I compare myself to the outside world, I am equal to zero

By comparing ourselves with the physical reality we realize that we are equal to zero and this is incompatible with the feeling we exist.

This conflict is well described in Shakespeare's Hamlet with the phrase "*to be or not to be*". Not being is incompatible with life. To continue to respond to the challenges of life we need to find a purpose, a meaning, otherwise it is all useless.

The identity conflict leads to a vital ***need for meaning*** which, when not satisfied, causes feelings of worthlessness and depression.

Depression is an unsustainable type of suffering and people face it trying to inflate their Ego, limiting the size of the world they are comparing to or simply erasing the outside world.

However, we manipulate the numerator and/or the denominator of the equation of the identity conflict the result continues to be always equal to zero.

The need for meaning is an invisible need. Most people are not aware of it, but still, it is vital, and we must constantly respond to it.

We must all give meaning to our life and to do so we often accept the most incredible contradictions.

The identity conflict equation suggests a solution:

$$\frac{I \ x \ \cancel{Outside\ World}}{\cancel{Outside\ World}} = I$$

When I compare myself to the outside world,
and I am united to it through love, I am equal to myself

This is called the *Theorem of Love* and shows that:

- only when our inner world unites with the outside world through love, we overcome the identity conflict.
- love provides this unity (I x Outside World), and therefore love is vital: it gives meaning to life.
- love allows to shift from duality (I=0) to unity (I=I).

When we love, we converge towards unity and our heart is filled with warmth, well-being, and happiness. When we do not love, we diverge, and we experience pain, emptiness and loneliness and our life is meaningless.

Today the word love is abused and can mean anything! So, let's see how it is used in this book.

First, love it is something that we feel in the form of warmth and well-being in the thoracic area. It may be accompanied by an increased heart rate, sweating, shortened breath, redness, dilated pupils.

Love is vital because it gives meaning to life and because it connects us with the Attractor.

What activates love becomes vital.

For this reason, when we find a source of love, we tend to cling to it and forget everything else. In the absence of love, suffering can become unbearable.

Let's recap:

– The first group of vital needs is commonly known as ***material needs***. To combat the dissipative effects of entropy, living systems must acquire syntropy through water, energy, and food, they must protect themselves from the dissipative effects of entropy and eliminate the remains of the destruction of structures by

entropy. These conditions include shelter, clothing, waste disposal and hygiene. The partial satisfaction of material needs is signaled by hunger, thirst, and various forms of suffering. Total dissatisfaction leads to death.

– The second vital need is commonly called the ***need for love***. Responding to material needs does not prevent entropy from destroying life. For example, cells die and must be replaced. To repair the damage caused by entropy, we must draw on the regenerative properties of syntropy which allow to create order, reconstruct structures, and increase the levels

of organization. The autonomic nervous system, which supports vital functions, acquires syntropy. Since syntropy acts as an absorber and energy concentrator, the intake of syntropy is felt in the thoracic area of the autonomic nervous system, in the form of warmth and well-being that we usually indicate as love; the lack of syntropy is perceived as emptiness and pain in the thoracic area, usually referred to as anxiety. In short, the need to acquire syntropy is felt as a need for love. When this need is not satisfied there is suffering in the form of emptiness and pain. When this need is totally unsatisfied, living systems are not able to

sustain the regenerative and vital processes and entropy takes over, bringing the system to death.

– The third vital need is commonly called the ***need for meaning***. To satisfy material needs we produce maps of the environment. These maps give rise to the identity conflict. Entropy has inflated the physical universe towards infinity, while syntropy concentrates consciousness in extremely limited spaces. As a result, when we compare ourselves to the infinity of the universe, we discover that we are equal to zero. On the one hand we feel we exist, on the other we are aware of being equal to zero.

These two opposing considerations "*to be or not to be*" cannot coexist. The identity conflict is characterized by lack of meaning, lack of energy, existential crisis and depression, generally perceived in the form of tensions in the head accompanied by anxiety. Being equal to zero is equivalent to death, which is incompatible with our feeling of existing. From this arises a vital need for meaning.

The solution to suffering is provided by the Theorem of Love. The Theorem of Love requires that we rely on the heart (the solar plexus) and use it consciously and intentionally to go towards the most beneficial

options.

Love is an invisible force, an inner power within, which provides enthusiasm. In Greek enthusiasm means "*God within*", an invisible force which lets us overcome the most incredible difficulties and endeavors.

The metaphor of the cart is often used to summarize:

- the cart is the physical body and requires maintenance.
- the horses are our impulses, that pull us in different directions and give the movement; they require energy and the guide of the coachman.

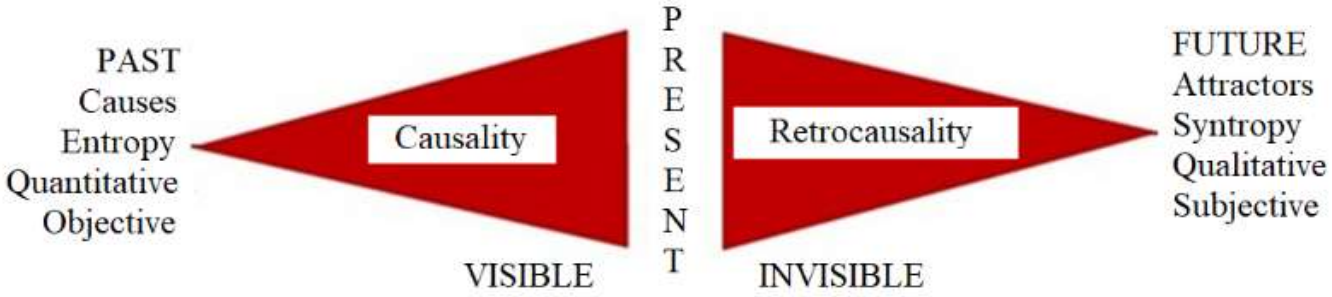
- the coachman is the mind, follows the orders of the master, directs the horses, and takes care of the cart.
- the master of the cart is the heart which provides direction and aim.

All functions well when:

- The cart is well cared for (*material needs*).
- Horses receive water and energy.
- The coachman follows the directives of the heart (ie the master).
- The master is guided by Love, by the Attractor. Love provides aim and objectives.

ATTRACTORS

The energy momentum mass equation suggests that the present can be described as the meeting point of causes that act from the past (causality) and attractors that act from the future (retrocausality).



Causality requires a big cause for a great effect, since causality diverges and tends to disperse. On the contrary with attractors the effect is amplified.

The smaller the cause, the more it can be amplified and the greater the effect.

This strangeness of attractors was discovered in 1963 by the meteorologist Edward Lorenz. When dealing with water, as happens in meteorology, a small variation can produce an amplifying effect. Lorenz described this situation with the famous phrase:

"*The flap of a butterfly in the Amazon can cause a hurricane in the United States*".

However, for this to happen it is necessary that the small flap (the active principle) is in line with the attractor. Otherwise, entropy prevails,

and the small energy of the flap is lost. On the contrary when the variation is in line with the attractor it is amplified.

The hydrogen bond of water operates in both directions: from the micro to the macro, amplifying the effect, and from the macro to the micro informing the attractor. This can help understand how homeopathic remedies work.

Homeopathy is based on water. When we insert into water the similar, the *simillimum*, of what we want to cure, its information enters the quantum level and informs the attractor. The greater the dilution, the greater the contribution of the

attractor in the amplification of the effect.

Homeopathy is the subject of ferocious attacks. In Italy the famous scientific television journalist Piero Angela reiterates that "*homeopathy is fresh water*", "*pseudoscience*" or even "*magical practice*" and constantly emphasizes that it has no scientific validity. "*It is a placebo effect; this is what the scientific community says.*" Angela underlines that "*for Rita Levi Montalcini (Italian Nobel Prize) homeopathy is potentially harmful because it distracts patients from valid treatments*" and that "*for Renato Dulbecco (another Italian Nobel Prize) it is a practice without any value.*" Lately the attacks on homeopathy have intensified; the

main accusations are that homeopathy is only fresh water and a placebo effect.

Experimental studies show the effectiveness of homeopathy, but conventional medicine continues to consider homeopathy non-scientific since the "active substance" (the solid substance) has been completely removed from water by dilution. It is considered impossible that water can be the cause of the effects observed in the experiments, since it is considered an inert substance.

Homeopathy was discovered in 1796 by the German doctor Samuel Hahnemann (1755-1843). This system is based on the so-called law of similes, according to which the

remedies must use substances that cause similar symptoms in healthy individuals. These substances are then diluted in water. The strange fact is that the higher the dilution the more powerful is the effect. The most powerful remedies are those in which the substances have been diluted to the point that it is impossible for a single molecule to still be present in the remedy. For conventional medicine, after removing the active ingredient through dilution, effects can only be placebo effects, not attributable to the remedy since no solid molecule of the active ingredient is present.

Syntropy claims that the active ingredient, when placed in water,

creates links with attractors. So by removing the active ingredient through dilution, these retrocausal bonds remain and are no longer related to the substance but are free to act on any other structure.

Syntropy explains the effects of homeopathy because of the retrocausal properties of water.[66] The remedies act from the future and the effects are the result of the interaction between causality that is governed by entropy and retrocausality that is governed by syntropy.

When using a substance that induces in the future of a healthy person symptoms like those observed in a

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[66] Paolella M.., *Homeopathic Medicine and Syntropy*: http://www.sintropia.it/journal/english/2014-eng-2-01.pdf

sick person and this substance is diluted in water (beyond the value of Avogadro), the future begins to retroact into the present.

With causality to increase the effect it is necessary to increase the cause (the active substance), while with retrocausality to increase the effect it is necessary to reduce the cause. Retrocausality works in the opposite way to causality. This explains why in homeopathy to enhance the remedy instead of increasing the active substance this is diluted.

Homeopathy cannot be explained based on classical causality, since the active ingredient is completely removed from homeopathic preparations (which are water based).

The therapeutic effects, however, are obvious and can be demonstrated experimentally. The results are strong even when no placebo effect is possible, as in the case of studies carried out on plants in agriculture.

The retrocausal properties of water are due to the hydrogen bond. The hydrogen atoms are in an intermediate position between the subatomic (quantum) and the molecular level and provide a bridge that allows syntropy to flow from the attractor to the macroscopic level.

Life shows an incredible complexity that converges towards common projects, despite individual differences. For example, we can

recognize different races, such as Europeans, Asians, Africans, but there is something that unites all these individuals and that makes them all human beings.

Considering only the contribution of the past, it is impossible to explain why individuals converge towards common projects and it is impossible to explain the stability of these projects over time.

Attractors describe this stability and this convergence.

The biologist Rupert Sheldrake has devised experiments that show that when individuals of the same species learn to solve a task, this knowledge spreads invisibly and immaterially to all the other individuals of the same

species.

Attractors behave like relays. When an individual solves a task and receives a benefit, the information is relayed to all the other individuals.

Attractors establish a bridge between individuals that allows them to develop a shared knowledge.

Individuals converging towards the same attractor can share knowledge invisibly, without the involvement of any physical means. This is known in quantum mechanics as entanglement and non-locality.

Attractors receive information and experiences from individuals, select what is advantageous and redistribute it. This process transforms individual experiences into intelligent

information, which provides solutions, projects, and form.

The verb "to inform" comes from the Latin "in-formare", which means "to give form". Aristotle believed that "in-formation" was a fundamental activity of energy and matter. In-formation does not have an immediate meaning, like the word "knowledge", but rather implies a modality that leads to the creation of forms. Once a form takes shape, it can be manifested in all individuals who are connected to the same attractor.

People often ask if attractors imply that the future is already determined. The answer is simply *NO*, they imply exactly the opposite!

Attractors indicate that we will

inevitably return to where syntropy originates, to the attractor, what Teilhard de Chardin calls the *Omega point*, but that the path depends on our choices.

If attractors did not exist, we would live in a mechanical universe totally determined by the past. Instead, we are constantly forced to choose between the head and the heart, between past and future.

Water is not an inert liquid, it is how we connect with the attractor, in-formation and nourish the vital processes of the body. The hydrogen bond provides water with properties different from those of all other liquids. These properties explain a wide range of phenomena that

medicine is not yet able to accept.

Water provides syntropy to living organisms and when there is a lack of water, entropy prevails, causing suffering and symptoms that are often interpreted by conventional medicine as organic diseases.

In the book "*Your Body's many Cries for Water*" the Iranian doctor Fereydoon Batmanghelidj (1931-2004) offers an important explanation of the role of water in life, and specifically in the human body.

Batmanghelidj completed his medical studies at St. Mary's Hospital in London and opened several clinics when he returned to Iran. However, during the 1979 Iranian revolution he was arrested and spent almost three

years in prison in Tehran. A prison that was designed for 600 people, but which housed more than 9 thousand people.

Here is how Batmanghelidj describes his discovery:

"The nightmare of life and death in that hell hole threatened everyone and tested the courage and strength of the weak and the strong. It was then that the human body revealed to me some of its greatest secrets, secrets never understood by medical science. (...) One night, after about two months of imprisonment, that secret was revealed. It was about 11 pm. I woke up, one of my cell mates suffered from terrible stomach pains. He couldn't walk alone. Others were helping him stand up. He suffered from peptic ulcer

and needed medical attention. He was very ill, but I was not allowed to take any medicine with me. At this point the surprising event occurred! I gave him two glasses of water and the pain disappeared within minutes and he could stand on his own again."[67]

Due to extreme conditions in Tehran prison, Batmanghelidj was able to discover that many diseases can be healed simply with water. Batmanghelidj concluded that the lack of water is expressed not only by thirst and dry mouth, but also by a series of localized symptoms that serve to inform us about a local need

[67] Batmanghelidj F (1992), *Your Body's many Cries for Water,* www.watercure.com

for water. These local signs of dehydration take the form of pain and are usually interpreted as symptoms of illness and not the need for water. Batmanghelidj realized that we often mistake pains caused by a local dehydration situation for diseases.

Conventional medicine concentrates on the solid 25% and does not consider the role of water (ie the other 75% of the body), since it assumes that the solid part is the active principle and that all the functions of the body depend on the solid while water works only as a solvent that fills the space.

The human body is considered as a large "test tube" filled with different types of solids and water as a

chemically inert and insignificant packaging material.

Conventional medicine assumes that solutes (substances dissolved or transported in the blood) regulate all the activities of the body, while it is assumed that the intake of water (the solvent) is generally well respected, since water is easily available.

Based on this hypothesis, medical research has been addressed to the study of solids that are considered responsible for the onset of diseases. To date, a dry mouth is the only recognized symptom of dehydration. However, according to Batmanghelidj, a dry mouth is only the ultimate symptom of extreme dehydration.

Dr. Batmanghelidj explains several diseases because of water deficiency: rheumatoid arthritis, hypertension, high cholesterol, excess body weight, asthma and some allergies.

According to Batmanghelidj the fundamental error of conventional medicine is to confuse dehydration with disease. This error inhibits the necessary preventive measures, and the patient is not provided with sufficient water treatments to cure his suffering. At the first appearance of pain, the body should receive water. In contrast, conventional medicine provides drugs that block the symptoms of the lack of water and the consequent conversion of symptoms into chronic diseases and chronic

dehydration.

Batmanghelidj suggests changing the medical paradigm, moving from a vision centered on the properties of the solute (solid matter, i.e., past causes) to a vision centered on the properties of the solvent (water, i.e., attractors).

Batmanghelidj states that the solvent (water) regulates the functions of the body, including the activities of all solutes (solids) dissolved in it.

In the supercausal paradigm diseases are interpreted as disorders of the body's water metabolism (solvent metabolism).

Water carries nutrients, hormones and chemical messages and performs multiple vital functions. The balance

between chemical and solid substances is restored by restoring the correct water balance. Water is the natural cure for a wide spectrum of disorders and complications that are currently labeled as “diseases”.

Attractors bring parts together. The unity of our Self is strengthened when we have a mission, when we are converging towards an attractor. When, on the contrary, we have no attractor cohesion diminishes, the chatter of the mind increases and our personality shatters.

Converging is therapeutic since it brings together our parts and makes them cooperate.

The evolutionary paleontologist

Teilhard de Chardin noticed that the incredible stability of species is given by the fact that they converge towards attractors. He advocated the idea that life is guided by attractors, and evolves according to a hierarchy of attractors, till the ultimate unifying attractor, the Omega point, is reached.

Since they reinforce the Self, attractors increase individualization, nonetheless they also lead towards unity.

It seems a contradiction, but unity and diversity go together! The path towards the attractor requires diversity, different species, different cultures, ideas, ideologies, and religions. Like the tiles of a mosaic which together form the unity of the

design, our individualities are pieces which converging together give place to the design.

Steve Jobs found his mission in a computer that could be held in a hand, and this became his life project. Everyone has a purpose in life. Small or big they are all equally important. When we reach our goal we can die happily, and then continue the adventure towards the Omega point in a new life, with another mission.

Life and death

Raymond Moody, an American psychologist and physician, became famous for his books on life after

death and near-death experiences (NDE), a term he coined in 1975 in his best-seller book *Life after Life*.

After a meeting with psychiatrist George Ritchie, who told him of an incident in which he died and had traveled in the afterlife, he began documenting reports of people who had experienced death.

Moody discovered that many elements are recurrent, such as the feeling of being out of one's body, the feeling of traveling through a tunnel, meeting dead relatives and of a bright light. After talking to over a thousand people who had this kind of experience, Moody started to support the idea that there is a life after death.

Moody noticed that people who die

and are then resurrected thanks to modern medical techniques, come back deeply transformed. They often abandon their work to venture into activities aimed at the well-being of others. Moody underlines that near-death experiences are deeply transformative, they allow people to discover the meaning of their life and to connect to the great energy of love, what we here call the *Attractor*.

But do people have to experience death to begin this transformation process?

The answer was provided by Brian Weiss and Michael Newton.

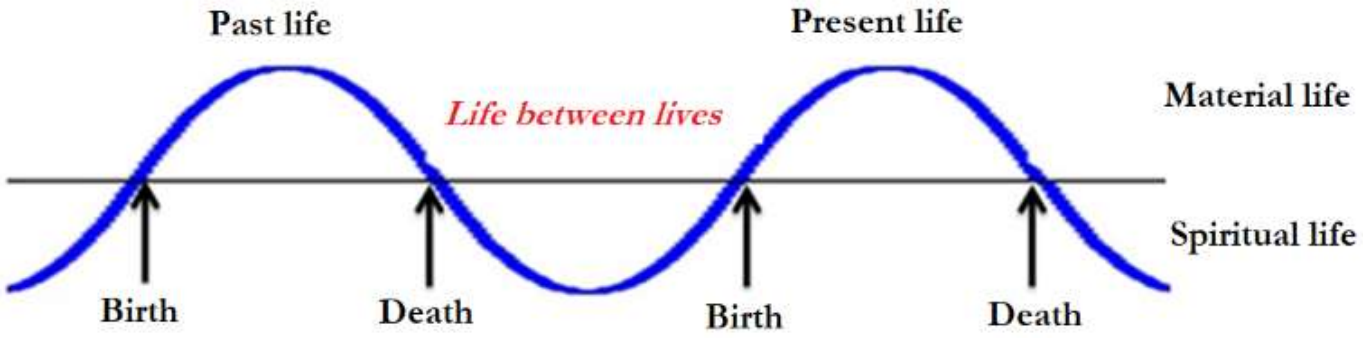
As a psychotherapist and psychiatrist Brian Weiss was skeptical about

reincarnation, but when one of his patients began to remember the traumas of a past life where he found the key to his recurring panic attacks and began channeling messages about Weiss's family and his dead son, Weiss began to use hypnosis to induce past life regressions.

Hypnotic trance is a state in which attention moves inward. We have continuous small hypnotic trances. Weiss found that a patient in a trance can easily live a previous life.

Michael Newton added hypnotic progression to hypnotic regression. After regressing his patients to a previous life, he used hypnotic progression to make them move to the point of death. This technique

allows to experience death without having to die.



The idea is that we vibrate between life and death. When we are born syntropy is high, but the material world increases entropy and leads us to death. Death is the transition from the material to the spiritual life. In spiritual life syntropy increases to the point of having to be reborn. Spiritual life is syntropic and the connection with the Attractor is strong. Material life is entropic, and the connection is

more difficult: we do not remember what our mission and purpose of life are and with great ease we fall into the fascination of entropy and materiality. The goal is to reconnect people to the Attractor.

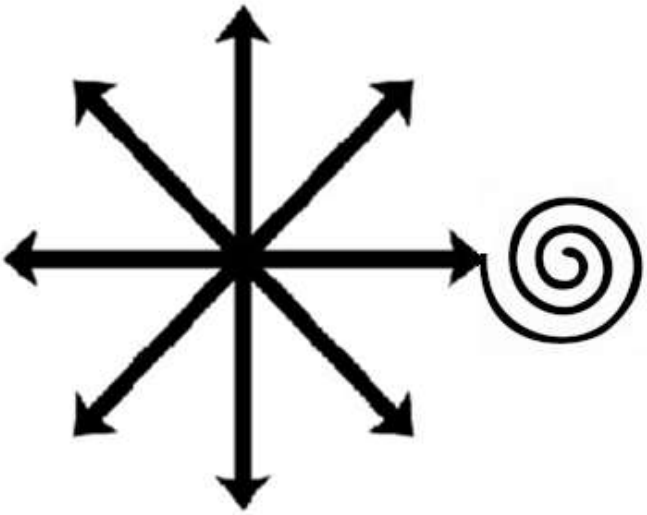
However, syntropy introduces a new concept of reincarnation that somehow contradicts or expands the model used by Weiss and Newton.

The unity of our soul is given by syntropy, by the fact that we converge towards the attractor. When we diverge the cohesive properties of syntropy diminish and our soul tends to shatter. This may explain numerous psychological and psychiatric disorders, such as the multiple personality disorder also known as

dissociative identity disorder. This disorder is characterized by at least two distinct and relatively enduring personalities. Often there are problems in remembering certain events, beyond what would be explained by ordinary forgetfulness and these states alternate in a person's behavior.

Syntropy suggests that we reincarnate only if the syntropic (cohesive) component is strong, otherwise when we die our soul dissipates and loses its identity.

We can represent this as follows:



We are free to go in all possible directions, but only one converges towards the attractor and leads our soul to be cohesive, allowing to maintain its identity.

On the contrary, the identity of those who move away from the attractor vanishes with death. The identities of people who move partially towards the attractor will mix up leading to multiple experiences of past lives where we can be the reincarnation of

a group of souls and not a single soul. According to Teilhard de Chardin the universe is gradually increasing its spirituality and eventually it will become a single soul that will unite with the Attractor in the Omega Point.

MIND AND CONSCIOUSNESS

Consciousness, the "*feeling of being alive*" is still a mystery. Neuroscientists assume that consciousness emerges from matter, whereas quantum scientists believe that matter emerges from consciousness.

Luigi Fantappiè and Pierre Teilhard de Chardin described consciousness as a property of the negative time energy. Physical energy can be perceived whereas the non-physical negative time energy can be felt: the head perceives, the heart feels.

We are constantly faced with what

the head and the heart say, and we are forced to choose. The heart gives us direction and aim, whereas the head provides tools and experience. Both are needed.

Starting from the dual energy solution the mathematician Chris King speculates that free will arises from the fact that we are faced with bifurcations between information arriving from the past (*entropy*) and information arriving from the future (*syntropy*).

These bifurcations entail choices and choosing puts us in a condition of free will.

Since the forward and the backward in time energies are perfectly balanced, similar amounts of

information and in-formation are received.

This might explain the perfect division of the brain into two hemispheres.

We can replace the previous illustration with that of the two hemispheres of the brain, where the left hemisphere is the seat of the "forward in time" logical reasoning and the right hemisphere is the seat of the "backward in time" intuitive reasoning.

Where the rational-logical thinking is objective and quantitative, and the intuitive thinking is subjective and qualitative.

Syntropy adds to this picture the compass of the heart and the attractor

and describes the mind as organized on three levels:

- the *conscious mind* which is associated to the head and free will.
- the *unconscious mind* which is associated to the autonomic nervous system and highly automated processes.
- the *super-conscious mind*, which is the attractor, it is future oriented and provides direction, purpose and meaning to our life.

The *conscious mind* on which we are tuned during the time we are awake, connects us to the physical reality. The conscious mind chooses between

feelings that come from the autonomic nervous system, i.e. the unconscious mind, and information that comes from the physical plane of reality. This continuous state of choice is at the basis of free will.

The *unconscious mind* governs the vital functions of the body, therefore called involuntary, such as heartbeat, digestion, regenerative functions, growth, and reproduction.

In addition, it implements highly automated programs, which allow us to perform many complex tasks, without having to think continuously about them, such as walking, riding a bicycle, driving, etc.

The autonomic nervous system

supplies the body with syntropy, and it is therefore the seat of feelings that inform us about the connection with the attractor. The unconscious mind can be accessed during dreams or using techniques of relaxation and altered states of consciousness such as hypnotic trance.

The *superconscious mind* is our attractor, the source of syntropy, the energy of life, which guides towards wellbeing and happiness.

The superconscious mind provides us with a mission, a purpose, and uses intuitions, insights, dreams, and visions. It provides intelligence, knowledge, and answers to problems. It leads towards more intelligent and

perfect designs which are the outcome of the contribution of all the individuals who share the same attractor.

The conscious mind and free will

The conscious mind must constantly choose between future and past, and this process is at the basis of free will. *In-formation* coming from the future acts as a pull factors, typically referred to as feelings of the heart, whereas *information* coming from the past acts as a push factors, typically based on memories, experiences, knowledge and acquired emotions.

We are constantly mediating between

pull and push factors.

Past and future cohabit in our mind and require the specialization of the two cerebral hemispheres. The cortex is not a single block, but it is split in the left hemisphere which is the seat of linear thinking, based on causality, and the right hemisphere which has a global approach and is guided by feelings.

The left hemisphere sees the shape, how things appear, whereas the right hemisphere feels the essence, the colors.

The left hemisphere is limited to exteriority, quantity and what is visible, the right hemisphere is focused on interiority, quality, feelings and what is invisible.

The neurophysiologist Antonio Damasio found that people with decision-making deficits, who are not capable of performing advantageous choices, show alterations in the ability to feel.

This deficit is common among people who have lesions in the frontal lobe of the brain or use drugs and alcohol which impair the ability to feel.

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 most 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.

Individuals with decision-making deficits are characterized by knowledge but not by feelings. They lack concern for the future, they are unable to plan and make an effective

program for the hours to come, they confuse priorities and lack insight and foresight.

Damasio shows that inner somatic sensations that take the form of feelings, acceleration of the heartbeat, hunches, contraction of breath, and muscles are fundamental in decision making.

In normal subjects, who decide advantageously, these feelings help to orient rationality, leading to an appropriate space in which the tools of logic can efficiently help the decision-making process.

Decision-making deficits suggest that there is a set of systems which orient thinking towards the future, towards an end, and that this set of

systems is at the basis of decision-making and it is guided by feelings.

The unconscious mind and the autonomic nervous system

The autonomic nervous system oversees acquiring syntropy and distribute it to the body, nourishing regenerative and healing processes, and providing the project, the shape, to the physical body and to its parts.

Attractors retroact from the future via the autonomic nervous system. At the same time attractors receives experiences from all the individuals linked to it and select what is advantageous to life, redistributing

this knowledge to all the individuals as in-formation.

According to this view evolution is a collective process which is guided by the intelligence arriving from the attractors.

The word intelligence comes from Latin, and it is the combinations of two words: *intus*=inside and *legere*=read.

If we try to explain intelligence, order, and in-formation as a result of past causes, we get into logical contradictions and paradoxes, since causality and random mutations are governed by entropy which leads to an increase in disorder. Nevertheless, we witness an incredible complexity and the convergence of this complexity

towards common and intelligent designs, despite individual differences. Considering only the influx of the past it is impossible to explain why individuals converge towards the same designs, and the stability of these designs in time. Attractors which retroact from the future can instead explain this. Once a form takes place in the attractor, it can in-form all the individuals linked to it.

The autonomic nervous system plays a key role since it connects individuals to the attractor and in this way receives life energy, (ie syntropy) and in-formation.

Despite the incredible amount of intelligence that in-formation shows, it is widespread at all the levels of life.

It is a property of the autonomic nervous system, i.e., the unconscious mind.

The autonomic nervous system:

- Is guided by feelings.
- It provides syntropy, vital energy, to the various organs of the body and performs healing actions based on the designs received from the attractor.
- It behaves like a mechanic who consults the book of the manufacturer to perform repairs and maintain the system as close as possible to the project. The project is not mechanical, and instructions are written with the ink of e-

motions.

- It underlies all the involuntary functions of the body and is responsible for controlling the motion of muscles and limbs.
- It governs all the functions of the body that are not subject to choose and which do not require the conscious level. For example, it is responsible for digestion, heart rate, assimilation of food, cell regeneration. These are processes which are completely unknown to our conscious mind. We do not know how they are carried out and, often, we do not even know that they exist. The body knows everything and shows an

extraordinary level of intelligence.

- It directs and regulates these processes, thereby expressing capabilities and intelligence which are incredibly higher than our conscious mind.
- It memorizes learning patterns of behavior which it then executes autonomously and automatically, and which are maintained over time, giving rise to habits and learning. This memory is then stored, at least in part, in the muscles of the body in the form of patterns of behavior.
- It repeats behavioral patterns, until they become habits that are activated automatically, regardless

of our will. These patterns are then placed firmly in the memory of the unconscious mind. The conscious mind often does not remember what was included in the memory of the unconscious mind. Consequently, accessing the unconscious mind can open incredible possibilities in the processes of knowing ourselves.

The unconscious mind also acts as a guardian of any information that the conscious mind cannot handle.

Nearly all visceral functions (heartbeat, breathing, digestion, etc.) are under the control of the autonomic nervous system which acquires syntropy. Since syntropy

flows backward in time it activates visceral feelings in advance, providing information about the future.

We often confuse feelings with emotions. Generally speaking, we can say that feelings are linked to attractors and to the future, whereas emotions are linked to the past and the present moment.

The superconscious mind and the attractor

The superconscious mind is the attractor. It is outside our physical body and time, and it is connected to our body via the autonomic nervous system (solar plexus/heart).

The attractor is the source of

syntropy. Since syntropy acts as an energy concentrator, a good connection with the attractor is signaled by feelings of warmth and wellbeing in the heart area. In contrast, a weak connection with the attractor is signaled by feelings of void and pain usually named anxiety and anguish, accompanied by symptoms of the autonomic nervous system, such as nausea, dizziness, and feelings of suffocation.

The superconscious mind provides aim and direction, intuitions, and insights of the future.

The connection with the attractor is fostered when we reduce entropy in our life, when we calm the chatter of our mind, our fears, and avoid the use

of alcohol, tobacco, drugs and coffee, when we nurture a good contact with nature, when we follow a vegetarian/liquidarian diet and a frugal and minimalist lifestyle.

The invisible world of syntropy works in the opposite way to the ordinary one: richness requires frugality, unity needs diversity, strong effects want small actions.

Results otherwise impossible can be achieved with little effort, such as transforming deserts into fertile soil, reviving the process of rainfalls, and reducing the greenhouse effect (see syntropic agriculture[68]); reduce debts and costs; meet the energy needs in an environmentally friendly and

[68] https://lifeinsyntropy.org/en/

sustainable way; turn crises into opportunities, produce wealth and wellbeing.

The difficulty lies in understanding the language of the heart. When we use the compass of the heart, we learn to choose in the most advantageous way for us and for the others.

To better understand how the superconscious mind works, it is worth quoting the words of the mathematician Henri Poincaré (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 elements of the problem. But, since the options are

infinite and it would take infinite lives to evaluate them all, some other type of process leads to the correct option.

"The genesis of mathematical creation is a problem which should intensely interest the psychologist … It is time to penetrate deeper and to see what goes on in the very soul of the mathematician. For this, I believe, I can do best by recalling memories of my own. … all my efforts only served to show me the difficulty … Thereupon I left for Mont-Valérien, where I was to go through my military service; so, I was very differently occupied. One day, going along the street, the solution of the difficulty which had stopped me suddenly appeared to me. … Most striking at first is this appearance of sudden illumination … These sudden inspirations never happen

except after some days of voluntary effort which has appeared fruitless … I have spoken of the feeling of absolute certitude accompanying the inspiration … the solution is felt rather than formulated … It may be surprising to see sensibility … the feeling of mathematical beauty, of the harmony of numbers and forms, of geometric elegance. This is a true aesthetic feeling that all real mathematicians know, and surely it belongs to sensibility."[69]

The process of creation can be divided into four phases:

– A conscious phase during which we acquire the elements that make up

[69] Henri Poincaré, *Mathematical Creation, from Science et méthode*, 1908.

the problem.

- An unconscious phase that ends with the intuition, which is highlighted by a feeling of certainty and beauty.
- Intuition is the starting point from which the conscious mind can formalize the details, thanks to the strict discipline and logical thinking of the conscious mind, of which the unconscious is incapable.
- When the details are formalized, the empirical validation ends the process.

When intuitions arise, we experience a feeling of certainty, warmth and beauty that lets the solution arise to

the conscious level of the mind.

The interaction between past and future, conscious and unconscious can be noticed in the strange strategy cats use when they want to jump on a table.

They are unable to see what is on the table, but they smell the food and want to get on it. They first start circling the table till they choose a spot. Then they start assessing the jump moving in a slow motion their back.

But what are they assessing, since it is impossible for them to see what is on the table? They cannot rely on any rational information for their assessment. And still, when they

jump, they land perfectly in the narrowest spots!

According to syntropy they engage a game with their feelings, assessing in this way the future outcome. They try infinite invisible jumps and feel the results. When the feeling is of certainty, and they jump. Feelings of certainty which accompany intuitions highlight the solution. Similar feelings are triggered by the attractor which provides us with life energy and purpose.

When does consciousness end?

The concept of brain death was introduced in the scientific world at

the same time to the first transplant of organs since the criteria of natural death (end of heart activity and blood circulation) does not allow organ transplants.

Brain death is believed to cause the death of consciousness and of life.

This assumption is used to legitimate organ transplants from warm bodies.

The first definition of brain death was developed in 1968 by an ad hoc committee set up at Harvard Medical School.

The Harvard criteria for brain death determination have now become the bases for national laws. These criteria establish when it is permissible to consider the patient "legally" dead. The Harvard criteria are also the bases

for the laws on organ transplantation since organs need to be removed from the donor when the heart is still beating.

In 1975 the second international symposium on brain death was held in Havana (Cuba). The central moment for the diagnosis of death is the cessation of all brain functions. Only then it is totally useless to continue to help the patient and to declare the state of death.

For cessation of all brain functions an EEG is defined as a "flat EEG" when the amplitude is not greater than 2 micro volts, corresponding to about 5% of normal activity.

The superconscious model of the mind considers consciousness placed

outside our physical body, entering the body through the solar plexus and not the brain. It is therefore connected to the activity of the heart and not of the brain.

This assertion is supported by the fact that, when explanting organs from a person who is legally defined as dead, with a low EEG activity, this person starts defending and screams and must be tied to the operating table to proceed to the explant of organs.

Furthermore, the number of people diagnosed with brain death, who wake in full consciousness is simply amazing.

According to syntropy, when the heart stops and the connection between the body and the attractor

ends, then death occurs. Syntropy stops flowing and all the organs and tissues die, making organ transplant impossible.

In 1985, with a statement of the Pontifical Academy of Sciences, the Vatican accepted the Harvard Report. Pope John Paul II talked in several occasions on the topic legitimating the removal of organs from warm bodies, despite the fact that they are still breathing and with their hearts beating.

On September 3, 2008, "*L'Osservatore Romano*", the Vatican newspaper, dedicated the editorial to the fortieth anniversary of the Harvard Report. In this editorial Lucetta Scaraffia declared that brain death cannot be

used to assert the end of a life and the definition of death should be reviewed in the name of new scientific assumptions.

A few days after the publication of Scaraffia's editorial a note from the Vatican Press Office stated, "*an article does not change the doctrine: it is an editorial in L'Osservatore Romano, signed by a person who brings the authority of that person.*"

The reactions of the medical / scientific world were immediate: "

The criteria for brain death are the only scientifically valid criteria in order to sanction the death of an individual." Moreover, "*the worldwide scientific community approves the criteria established by the Harvard report*

and the criticism that comes from fringe minority, are based essentially on non-scientific considerations." Finally, "*scientifically advanced countries have accepted as the norm all the criteria of brain death.*"

However, the debate within the scientific Catholic world continues to grow. A whole chapter in a book edited by Paolo Becchi: "*Brain death and organ transplantation. A question of legal ethics,*" published by Morcelliana of Brescia illustrates the ambiguity of the Vatican and contains the statement of Hans Jonas's who argues that the new definition of death established by the Harvard report was not motivated by any real scientific

discovery, but by the need for organs for transplantation.

In 1989, the Pontifical Academy of Sciences had addressed the question and Professor Josef Seifert, Dean of the International Philosophical Academy of Liechtenstein, was the only one to object to the definition of brain death.

But, when the Pontifical Academy of Sciences met again to discuss the issue, on 3-4 January 2005, the positions reversed. The participants, philosophers, jurists and neurologists from various countries, agreed in considering that brain death is not death of the human being, and that the criterion of brain death is not scientifically credible and should

therefore be abandoned.

For the Vatican officials who subscribed the Harvard report these results were unacceptable and Bishop Marcelo Sánchez Sorondo, chancellor of the Pontifical Academy of Sciences, ordered not to publish the proceedings of the meeting.

Several speakers gave their papers to an outside publisher, Rubbettino, and a book was published with the Latin title "*Finis Vitae*", edited by Professor Roberto de Mattei, deputy director of the Italian National Research Council. The book was published in two editions, in Italian and English and contained eighteen essays, half of whom have been written by scholars who did not attend the meeting of the

Pontifical Academy of Sciences, but shared its views, among which that of Professor Becchi.

Consciousness in China

In Chinese ideograms consciousness is described using two ideograms: the ideogram of the heart 心 (xin) and the ideogram of the head 头 (tou):

心头

The heart is placed in the first position, thus telling that the essence of consciousness is the heart, whereas the head is placed in the second

position, thus suggesting that it is a tool of consciousness.

It is also remarkable to note that in Chinese ideograms an “idea” is the combination of the heart on the left and the ideogram “to think” 想 on the right. The ideogram “think” contains the ideogram of the heart as a radical:

心想

When we communicate our thoughts to someone we have at the left “message” 信 and at the right the heart. In other words, our thoughts are “messages from the heart”:

信心

For insights and intuitions on the left of the heart there is the ideogram warmth. Intuitions are described as feelings of “warmth in the heart”:

热心

Being diligent, attentive, devoted to a project is described as “eye of the heart”:

目心

When during our business we are scrupulous we use the ideogram “a

lot” associated with the heart:

多心

When we become actors of our choices, of our free will, we use the ideogram “force” associated to the heart, “a strong heart”:

心力

However, when we are depressed, we talk about “grey heart” a “heart with no color”:

心灰

Finally, when we can solve a problem, we talk about a “peaceful heart”:

心安

Ideograms suggest that when it comes to consciousness, attention should shift from the head to the heart.

This same consideration can be found in many ancient civilizations.

In ancient Egypt the heart was the seat of consciousness, whereas the brain was considered unnecessary fat material.

In ancient Greek, Roman, Indian, Arab, and Jewish civilizations, the scientific, medical, philosophical, and mystical systems considered the heart the seat of consciousness, whereas the brain was a tool, the servant of the heart.

THE UNITARY THEORY

Luigi Fantappiè was born in Viterbo, Italy, on September 15, 1901.

He graduated from the most exclusive Italian university, the Scuola Normale Superiore di Pisa, at the age of 21. During the University years he became good friend with Enrico Fermi. and was very well known among physicists.

After the dissertation Fantappiè moved to Paris and then to Germany giving lectures.

When he came back to Italy he was assigned at the University of Rome where he became full professor at the

age of 27.

In the years 1934-1939 he was sent to Brazil to start the faculty of mathematics in San Paolo.

In April 1951 Oppenheimer invited him to become a member of the exclusive Institute for Advanced Study in Princeton and work directly with Einstein.

Fantappiè died during the night between the 28th and 29th of July 1956.

This is how Fantappiè described his Unitary Theory in a letter to a friend:

"*It was in the days just before Christmas 1941, because of conversations with two colleagues, a physicist and a biologist, that I was suddenly projected in a new panorama, which radically changed the vision of science*

and of the Universe which I had inherited from my teachers, and which I had always considered the strong and certain ground on which to base my scientific investigations.

Suddenly I saw the possibility of interpreting a wide range of solutions, the advanced potentials of the wave equation which can be considered the fundamental law of the Universe. These solutions had been always rejected as impossible, but suddenly they appeared possible, and they explained a new category of phenomena which I later named syntropic, totally different from the mechanical, physical, and chemical laws, which obey only the principle of causation and the law of entropy.

Syntropic phenomena, which are represented by those strange solutions of the advanced potentials, obey two opposite principles of

finality and differentiation and they are not causable in a laboratory.

Its finalistic properties justify the refusal among scientists, who accepted without any doubt the assumption that finalism is a metaphysical principle, outside Science and Nature. This assumption obstructed the way to a calm investigation of the real existence of this second type of phenomena; an investigation which I accepted to carry out, even though I felt as if I were falling in an abyss, with incredible consequences and conclusions.

It suddenly seemed as if the sky were falling apart, or at least the certainties on which mechanical science had based its assumptions. It appeared clear to me that these "syntropic", finalistic phenomena which lead to differentiation and could not be

reproduced in a laboratory, were real, and existed in nature, as I could recognize them in the living systems.

The properties of syntropy opened consequences which were just incredible, and which could deeply change the biological, medical, psychological, and social sciences."

This theory unifies the physical, chemical, biological and psychological phenomena, including those of consciousness, in the same rational frame. It also provides interpretations of the fundamental phenomena of quantum mechanics.

It might seem strange that a mathematician adventured himself in such a wide exploration in the fields of other sciences, without having a

specific knowledge of them. This consideration stopped Fantappiè in letting his theory become public. But when he outlined its content to the colleague and friend Professor Azzi of the University of Perugia and received a strong and positive support, he felt he had to formulate it in a more detailed way and discuss it with colleagues of other disciplines.

Fantappiè presented his *Unitary Theory* on November 3, 1942, in Spain, at a conference at the *Consejo Nacional de Investigaciones Cientificas*. He then was invited to Barcelona by the *Academy of Science*, where on December 1, 1942, he discussed the details of the Theory in a private meeting.

On the days that go from the 31st of

May to the 2nd of June 1943 he was invited by Professor Carlini to the Science and Philosophy conference which was held at the *Scuola Normale Superiore di Pisa*. In this occasion he presented his Unitary Theory among scientists of the most diverse orientations and was able to discuss it with many prestigious colleagues, among whom professors Severi, Rondoni, Carrelli, Puccianti, Persico, Guzzo, Abbagnano and Banfi and was given an entire afternoon for questions and answers. It was then that he decided to write *The Unitary Theory of the Physical and Biological World*.

In this chapter Luigi Fantappiè's Unitary Theory is presented using mainly an adaptation of his works:

As Fantappiè shows, the Unitary Theory:

- confirms the law of causality and the second principle of thermodynamics for all the phenomena which we call entropic. Causality, which was a conceptual category, becomes a law of the entropic phenomena, which has a precise and objective meaning.
- describes phenomena totally different from the entropic ones, which we can find in the mysterious properties of life. These phenomena are predicted and explained by the same equations which govern the entropic

phenomena but are essentially different and allow to see an immense panorama, which might be more vast, diversified and meaningful of the entropic phenomena.

– shows that the same wave equation which combines special relativity with quantum mechanics predicts syntropic and entropic phenomena. Syntropic phenomena are moved by attractors, finalities, whereas entropic phenomena are moved by causes.

Scientists had postulated that using the principle of causality all natural phenomena can be reproduced. The

Unitary Theory shows that only the entropic phenomena can be caused and reproduced, whereas syntropic phenomena cannot be caused and reproduced, they can only be observed.

All the knowledge that has been developed in the last centuries using the experimental method, on which science is based, is limited to the entropic side of nature, whereas for the syntropic phenomena we need a new scientific methodology.

Syntropic phenomena can be influenced indirectly from specific entropic phenomena, but overall, they constitute an extremely important part of the universe which is beyond our possibility of manipulation.

The entropic side of reality will inevitably fail to account for the totality, since the laws of nature are symmetric regarding time and can be diverging-entropic and converging-syntropic, and this last type of phenomena are those which are at the essence of Fantappiè's discovery.

If we look at the present knowledge of the intimate structure of the Universe, we see that it can be summarized in three basic points:

– Dalton's atomic theory established in the XVIII century and later improved by Stanislao Cannizzaro, with the distinction of molecules and atoms, and then by Lorentz

who formulated the particle theory of electromagnetism and Planck and Einstein with the quantum theory of energy. These results on the intimate atomic-particle nature of matter of the entire Universe is now considered acquired, since it has been tested and validated for more than two centuries.

– The wave nature of all the physical phenomena, when considered in their most profound essence, at the level of quantum mechanics. Studied by Heisenberg, Schrödinger, Dirac, and others has given birth to modern nuclear physics. The wave nature of the physical phenomena can now be

considered acquired thanks to the experimental validation of Davison and Germer with electron rays which shows diffraction and interference properties in particles. These properties are typical of waves.

- The validity of the Theory of Special Relativity, which has received corroboration at the atomic level, such as the explanation of the increase in mass, the inertia of the electron, and the increase in speed. This theory leads to a description based on four dimensions which unites space with time, reaching in this way a perfect symmetry among the

spatial and time dimension. This representation is named chronotype.

How can these three fundamental elements be harmonized?

First, the atomic-particle nature of matter and the wave manifestation seemed to conflict, since one is deterministic and the other probabilistic.

This conflict has been solved saying that it is impossible to predict in a deterministic way the behavior of particles since the prediction is attributed to waves which are probabilistic.

Waves offer a deterministic prediction only when we consider

large numbers of particles.[70]

In Boltzmann and Poincaré theory the Universe was described as governed by strictly deterministic laws, both at the macro and at the micro level. Probability was used in a way which was considered only to be temporary, with the belief that the evolution of science would have replaced the mean values of probability with the exact values of the rigorous deterministic laws, which

[70] Wave phenomena are represented by differential equations with second order derivatives of the hyperbolic type, whereas in order to describe the phenomena studied by classical mechanics and by optics equations with first order derivatives are used (Jacobi equations) or the equivalent ordinary differential equations (canonical mechanical equations). This implies that whereas in classical mechanics we can distinguish trajectories of entities with their own individuality, in wave mechanics the presence of equations with partial derivatives of an hyperbolic order greater than one leads to phenomena which are not localized, with the change of time, in a limited area (just think of the space occupied by a particle).

were believed to be at the foundation also of the microcosm.

Now, instead, the probabilistic laws of these phenomena are at the foundation of the Universe, whereas the deterministic laws, which are valid at the macro level, are only a consequence of the law of large numbers.

In 1927 Schrödinger renounced to special relativity in the formulation of his wave equation since in quantum mechanics waves should propagate at infinite speeds, and this conflicts with the theory of special relativity which prohibits speeds greater than the speed of light.[71] The conflict between

[71] Schrödinger's wave equation takes the Hamiltonian function H, which characterizes the system in classical mechanics and measures the total energy relative to its space coordinates and to the

Schrödinger's non-relativistic wave equation and special relativity is obvious also at the general level, since time appears in a non-symmetric way, as a first derivative.

It is generally accepted that Schrödinger's wave equation is only a

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momentums, and writes that the wave equation (which describes with the square of its modulus the probabilistic density) has a variation in time (a first derivative relative to time, using the mathematical language) which is proportional, for a constant factor, to an expression which is obtained applying to the same function a linear differential operator, which is obtained from the Hamiltonian function replacing the momentums with the derivatives of the corresponding variables, changed using a constant factor. Since the Hamiltonian function is squared for the momentums, a linear expression of the second derivatives is obtained referring only to the spatial variables, and a term which contains the unknown function y (which is relative to the potential), and a last term in which the first derivative is relative to time. In the case of a single particle with the space coordinates x, y, z, Schrödinger's wave equation is a linear differential equation of the second order, which contains the first derivative relative to time, and the second derivatives of the space variables are always parabolic (since the particle is a H term which is expressed by a polynomial of the second order in the momentums), of the same kind of the equation that governs the conduction of heat in solid matter.

temporary description of the quantum phenomena, which is valid with good approximation only in those cases in which the speed of light can be considered infinite, but which will have to be replaced by a quantum-wave theory which is more exact and agrees with special relativity.

On the contrary relativistic wave equations are symmetrical for all four variables, the space variables x, y, z and the time variable t, in agreement with special relativity. In this way a second order equation is obtained not only for the space variable, but also for time, and the D'Alembert operator is used.

The study of such an equation was brilliantly conducted by Dirac,

considering all its implications, in the case of the electron, decomposing the equation of the second order in an equation of the first order, and showing that this wave-relativistic equation of the electron allows the full explanation of phenomena that until then where difficult to understand rationally, such as the magnetic momentum of the electron, which we now call the spin, which is due to the rotation of the electron on itself. Dirac found in his equation that beside the usual electron, also a symmetrical solution appeared, a neg-electron which is now named positron, which had not been observed since then and which was impossible.

But after a short time, the positron was discovered by Blackett and Occhialini, and this validated the prediction that Dirac's equation made of this particle, showing at the same time the strong foundation of quantum mechanics when combined with special relativity.[72]

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[72] The most important properties of the second derivative equation which was initially formulated by Dirac are obtained from the characteristic cone, which is determined by the second order terms of the equation. These terms are found applying the D'Alembert operator to the unknown function, and consequently the characteristic cone is always real, matching the chronotype which, with the vertex in the assigned event, divides the events from the future to the past ones and from those which can be concomitant, according to Special Relativity. Consequently from this structure of the characteristic cone the value of the unknown function y of the assigned event (that is to say in the point of the chronotype with coordinates x,y,z,t), at least in the case of the events which we have previously determined, can depend only on the values of y and eventually on the terms of the equation (which represents the density of the distribution of the sources of the wave propagation) known from the past events, whereas the value of the y point and of the known term can influence only the values that y acquires in the field of the future events. In other words, the field dependence of the solutions of the event which has been considered is

It is important to underline that although we don't yet have the details of the partial derivatives equations which describe in all their details the various quantum systems, we can determine some very important characteristics of these unknown differential equations, such as the fact that the properties of the characteristic cone will apply to all, and the fields of dependency and

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attributed only to the past events, whereas the field influence to the future events, whereas events outside of the chronotype cannot influence or be influenced by the event. For those who are less familiar with the four dimensional representation of the chronotype, it is sufficient to say that the past events, that is events which fall within the boundaries of the cone, are given for each instant before the one we are considering t, by the points within a sphere with its center in the points x,y,z with a radius which decreases with the speed of light, till it reaches zero in the instant t, whereas the future events are given, for each instant following t by the points of a sphere, with the same center, with a radius which increases with the speed of light, starting from the zero value at the instant t.

influence of the solutions, which are described by Dirac's equation.

These properties have been deduced from those of the D'Alembert operator, which is linked only to the geometrical nature of the chronotype and does not depend on the particular properties of the particle, which are instead described by the other terms of the equation which do not influence at all the geometrical nature of the chronotype. The chronotype does not vary when we consider a different type of particle, or particle systems, we will have that also for the equations of unknown partial derivatives, which support these quantum systems, the characteristic cone and the fields of dependency

and influence of the solutions will be the same of those that Dirac found in his equations.[73]

The fundamental solutions of the D'Alembert operator have been provided by Poincaré[74], Ritz[75] and Giorgi[76]. A first solution describes

[73] This can be clearly stated following another path; if we just consider that in wave phenomena the partial derivatives equations which describe them need to be of the hyperbolic type, and need to satisfy special relativity, the values of the solutions of a point x,y,z at an instant t, for any phenomena which we have caused, must be the consequence of values within the converging sphere towards the point at the speed of light (past events according to special relativity) and can effect only those points within the sphere which diverges from the same point, with the same speed (future events according to special relativity), otherwise if an element outside these two regions could affect or be affected from the event, the action between the two events should propagate at speeds which are greater than the speed of light, which according to special relativity is impossible.

[74] H. Poincaré, Electricité et optiqtee, 2.e éd., Paris, 1901

[75] W. Ritz, Recherches critigues sur l'électrodinantique générale, Ann de physique, 8 s., t. 13, 1908, p. 145

[76] G. Giorgi, *Sulla sufficienza delle equazioni differenziali della fisica matentatica*, Rend. Lincei, s. Ga, vol. VIII, 1928. Per un'ampia bibliografia sull'argomento, cfr. A. Cabras, Sulla teoria balistica della luce, Mem. Lincei, s. 6a, vol. III, f. 6°, 1929.

waves diverging from the source and are named *delayed potentials*.[77] A second solution describes waves converging to the source and are named *advanced potentials*.

The criticisms to the possibility of advanced waves were made mainly by Wiechert, Lorenz, Poincaré, Ritz and Giorgi, who considered that if converging waves existed it would be possible to concentrate energy and, in this way, to devise a perpetual motion machine. And this was impossible.

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[77] Starting from the hypothesis that the wave always starts from a source, with a density measured by the second known member of the equation; this solution is obtained in each point as the sum (integral) of the infinitesimal contributes (potentials) due to the sources, distributed in the single elements of the volume, in previous instants (to that which is being considered) at a certain time, that is needed for the wave to diverge at the speed of light c, from the volume element where the source is situated at the point considered;

Now, let us see how the notion of cause and causality, as they are understood by physicists and modern scientists, differ from the more general "deterministic principle", considered as the possibility of making a prediction.

When we say that the event A causes B, we believe that once we have observed A we can certainly predict that B will become true. But we can also predict that after the event of night the Sun will rise, however no one can say that the rise of the Sun is caused by the night. In the notion of causality there is something more.

When can we say that A causes B?

The answer to this question must be searched in the experimental method,

which Galileo put at the foundation of all the modern sciences.[78]

A is the cause of B when we insert experimentally A and we observe B.

But to have a convincing experiment we need to be free, at least within certain boundaries to cause A, where and when we wish. As a matter of fact, if someone would want to convince that A is the cause of B producing A to assess B, only in a specific place and time, we would remain skeptic.

The experimental method provides an exhaustive answer to the question if A is the cause of B, only when we have the total freedom to produce A

[78] The definition of cause which we give here coincides with the definition that Galileo gave: "*A cause is that which when present is followed by an effect and when removed the effect disappears.*"

and see if B follows. Only in this condition we can be sure that A is the cause of B. This leads to the important conclusion that we can recognize the events which are the cause of others only thanks to the free will of the experimenter.

Causality gives way to the more general and objective "determinism" which tries to determine past and future events analyzing present events. But also, determinism has shown to be insufficient in the study of particles, leaving the field to a wider perspective in the microcosm, which is based on probability.

We can state that widening our knowledge the categories which we were trying to apply have widened,

moving from the law of causality to determinism, to the modern probabilistic theories of quantum mechanics.

This does not mean that causality and determinism should be abandoned, but they cannot be used to explain all the reality.

Causality and determinism are certainly useful and fundamental in the study of a well-defined parts of reality. When we move from wave mechanics to the more limited deterministic field of the macrocosm, where the law of large numbers applies, probabilities change into frequencies which can be handled in a deterministic way.

If we isolate the system in such a way

that nothing happens beside what the experimenter wants with his free-will and B is different from zero only from the moment when A is produced, we can state that A causes B. The cause becomes the source which causes B and, therefore, each event B which is caused by A, is always affected by diverging waves from the point A. The solution that governs B will therefore be of the type of the *delayed potentials*.

This implies that causable phenomena are always entropic. Each entropic phenomenon, each phenomenon based on diverging waves has its cause in the source from which the diverging waves originate.

In this way we get to the

fundamental theorem:

A necessary and sufficient condition for B to be entropic, is that it can be caused using another phenomenon A, which is the source from which the diverging waves that constitute B are emitted.

Most of the physical and chemical phenomena, which we can study in our laboratories, are entropic.

Causality applies to entropic phenomena, such as those studied in mechanics, acoustics, optics, electromagnetism, and chemistry. This does not exclude that in nature we can have other phenomena, beside the entropic ones, such as the syntropic phenomena, which cannot

be caused using our free-will, since they would then fall within the entropic phenomena.

Diverging waves imply necessarily the second law of thermodynamics, which states that entropy does not diminish, but increases during time.

From an intuitive point of view, we can consider entropy as a state of leveling of a large number of particles. Diverging waves dilute in spaces which are always bigger, and if the space is limited, as it happens in a container, their intensity tends to level.

The wave equation extends this law to all the phenomena which are governed by diverging waves and in this way the second law of

thermodynamics is no longer obtained from a probabilistic postulate, such as Clausius' principle of the elementary disorder, but it is a logical and necessary consequence of the law of causality. When the law of causality applies to a phenomenon, we can say that this phenomenon is entropic.

This is the reason why it is impossible to obtain a perpetual motion machine. The degradation of energy is a necessary and logical consequence of the law of entropy which applies to all the machines. The main argumentation which is used to exclude advanced potentials is that they would allow to devise perpetual motion machines, converging the

energy that was first dispersed towards a point and then diverging it, then again converging it, and so on forever.

The main characteristics and properties of those phenomena which are constituted by advanced waves, which Fantappiè named syntropic, are profoundly different from the entropic phenomena previously described:

– They *cannot be caused* by our free will, at least in their essential components constituted by the converging waves, since on the contrary they would fall in the category of the entropic

phenomena, which are governed by the law of causality, and characterized by diverging waves. For the same reason, syntropic phenomena can be influenced, in their evolution, only indirectly by specific entropic phenomena, the only which we can use, which can interfere with, for example by modifying the environment in which they take place, since it is plausible that if the two phenomena exist, they are not separated in nature, but intertwined.

– They *concentrate energy* within always smaller spaces. Also, the particles represented by these waves

progressively concentrate in the center of the waves. Whereas the entropic systems go from concentrated to dispersed, in the syntropic phenomena exactly the opposite happens. We first have dispersed phenomena which concentrate in always smaller spaces. The entropic phenomena manifest with dissipative characteristics. An example is when we light a match. We have a cause which is concentrated in a small space, from which the light irradiates, with an intensity that diminishes with the distance, diluting the effect. Syntropic phenomena manifest with an anti-dispersive character, a converging

manifestation, which goes from diluted to concentrated in specific points. Whereas the entropic phenomena radiate from specific points, syntropic phenomena concentrate towards specific points.

– The *concentration of energy cannot be endless*. Since it cannot continue indefinitely, after a period of syntropic concentration entropic dissipation takes over. This means that we witness a process of exchange of matter and energy. Incoming energy and matter indicate syntropic processes, outgoing energy and matter indicate compensatory entropic

processes.

- *Entropy diminishes*, since with time differentiation increases. From a rigorous formal point of view syntropy has the same value of the second law of thermodynamics.
- We see a *tendency towards differentiation and complexity*. Syntropic phenomena show in complex forms, as it happens with biological systems which cannot be explained in a satisfactory way by using only their physical and chemical properties.
- They are *in a continuous state of energy dissipation* (warm bodies), and this is a consequence of the fact that syntropic systems absorb energy,

but they don't evolve towards heat death.

It is possible to scientifically study syntropic phenomena considering that the D'Alembert equation is time reversal. This equation is symmetrical in respect to time.

Reversing the time variable all the solutions of the delayed potentials become solutions of the advanced potential, and vice versa. Consequently, a very simple way to obtain the syntropic properties of a system from the entropic ones is just to invert the time direction.

Nearly all the phenomena are dual phenomena. In our language this is usually expressed by adding the prefix

“anti”: combustion becomes anti-combustion, filtration anti-filtration, matter anti-matter, energy anti-energy, etc. Applying this principle of duality we can obtain the characteristics of the syntropic phenomena from its dual entropic phenomena.

According to the D’Alembert equation, entropic phenomena are activated when waves start diverging from the source. For example, when we light a match electromagnetic waves start diverging at the speed of light in all the directions in a uniform way.

When we reverse the flow of time the dual syntropic phenomena shows. Waves concentrate towards the center

of the sphere, increasing their intensity. These waves would be uniformly distributed in all the directions, independently from where they seem to come.

Let us consider the waves which propagate on a pond. We can cause this phenomenon, which is therefore entropic, by throwing a stone in the pond and observe how the waves propagate and diverge. The dual syntropic phenomenon would show these waves perturbations concentrate in a point from which the stone would then emerge, leaving behind the water at rest. If we could observe such a phenomenon, we would think that some sort of intelligent being had organized it.

Now, let us imagine a brand-new telescope that we have forgotten in our garden. At first rust forms, then it falls and breaks into pieces. Pieces of metal and glass gradually deteriorate and mix with the ground. Changing the time flow we would see that from the ground different pieces of metal and glass separate, then they find their place in a design of lenses and tubes which form the telescope until a brand new and perfectly functioning telescope is reached.

What puzzles us is the finalistic aim, which we usually attribute to the action of an intelligent being. Syntropic processes express finality, a purpose, intelligence as if a will is acting on them.

Finality is the characteristic of the syntropic phenomenon.

The law of causality and the law of finality are logical consequences of the intimate duality of the fundamental laws of physics. It is possible to state that without causes entropic phenomena cannot exist and without finalities syntropic phenomena cannot exist. Without causes and finalities the wave equations would be null. Consequently, finality is not an accidental manifestation in a syntropic phenomenon, but a necessary condition of the syntropic phenomenon, without which it could not exist.

Science has investigated the entropic

physical and chemical characteristics of life, without grabbing the essence of life. It is now well acquired in biology, thanks to the experiments devised by Pasteur, that there is no possibility of spontaneously producing life without starting from a minimum amount of life. This is referred to using the Latin words «*vivum nisi ex vivo*». Life stems from life. It is impossible to create life at our will. The non-causability of life tells that it is a syntropic phenomenon. It is also well known that vital phenomena cannot be influenced directly, but only indirectly. For example, we cannot produce directly a plant or an animal with our hands, but we can only grow

or raise them.

All living organisms concentrate in their body matter and energy. This tendency is visible especially in plants and it is due to the chlorophyllian process.

We can therefore assume that in plants there is a quantitative prevalence of the converging syntropic phenomenon, which is also present in animals in their growth stage and then it is balanced with entropic processes at the adult stage, which start becoming gradually more relevant with aging and then totally prevailing with death.

It is interesting to note that in metabolism the syntropic processes of absorption of matter and energy

and construction of structures are named *anabolic*, whereas the entropic processes of dissipation, destruction of structure and release of energy and matter are named *catabolic*.

The syntropic process of energy absorption is always coupled with its dual phenomenon of energy dissipation. One of the major properties of life is that it is constantly releasing energy. This constant release of energy and by-products is coupled with the assimilation of matter and energy. A process of exchange of matter and energy which is named metabolism.

During the growth period, anabolic processes are prevalent and an increase in differentiation is observed.

It is interesting to note that the probability that the smallest protein molecule arises by chance is less than 10^{-600}. This is an incredibly small number, represented by a 0 followed by 600 zeros and at the end, on the right, the number 1. In other words, the spontaneous formation of the smallest life molecule results to be practically impossible. The incredible number of proteins that life shows conflicts with the second law of thermodynamics. This means that the law of entropy does not apply to life and that life is not an entropic phenomenon.

Finality is the fundamental characteristic of any syntropic phenomena, similarly to the principle

of causality which is the fundamental characteristic of any entropic phenomena.

Only thanks to the principle of finality we can logically understand the smallest and most complex architecture of the living systems. Organisms differentiate in organs which are harmonically coordinated and arranged to reach a purpose. For example, the development of the eye starts from cells which are very similar, which then differentiate and take place in such ways that they build the elements of a perfect eye, such as lenses, vitreous body, which are by far more complex of a single protein.

The principle of finality shows that pretending to understand life through

its physical and chemical elements, which are governed by causality, is just an illusion. Finality on which life is founded is similar and dual to the principle of causality which governs the entropic systems. Causality is the essence of the physical world; finality is the essence of life. Living systems tend towards aims and purposes. Life systems have a mission, and the greater the mission is, the more complex is the living system, with complex organs meant to reach its purpose.

The difficulty with the principle of finality is commonly found in the various theories of evolution. If we examine the most popular one, Darwin's theory of evolution, we see

that it is based on three facts: the variability of life forms, the fight for survival, and the long permanence of life on Earth. These facts cannot be denied but are not sufficient to explain life and all the various species of organisms.

In 1865 Mendel's experiments on plant hybridization seemed to prove the theory of evolution which Charles Darwin had published in 1859. But with Mendel we are not witnessing the formation of new species, we are witnessing the separation of genetic information into different characters and forms.

According to Darwin at the beginning on Earth only few simple unicellular life systems could exist.

Darwin introduces the concept of random variability as the cause of new species. About randomness, the probability of the random formation of any living system can be calculated using the kinetic theory of gasses which considers all the possible combinations with the same probability. Using this assumption, the probability of the formation of the smallest protein is less than 10^{-600}. It is therefore easy to imagine how smaller the probability of the formation of an organ is, such as the eye, the ear, or any of the apparatuses that we commonly use. The probability of the formation of a whole animal is even smaller. The random permutations which are required for the formation

of just one protein are greater than all the possible permutations in the history of the entire Universe. Consequently, the long permanence of life on Earth is insufficient to account for the formation of the smallest forms of life and of any living being. The probability of life happening by chance are by far smaller than the probability of witnessing water freezing when put in a pot placed on the flame of a cooker.

And, if life is caused it should obey the law of entropy and go towards the dissolution of any form of organization and complexity. With time we would see the increase of entropy and it is illogical to pretend that complexity can be achieved at the

expenses of other beings or using the light of the Sun since in the first stages of the evolution of life on Earth, there weren't other beings, and the atmosphere did not allow Sun rays to reach the land.

When on the contrary we consider life as a syntropic phenomenon, the principle of finality applies and leads to increase differentiation, complexity, and harmony.

The planet Earth can be considered as an immense living organism. The fact that species are interdependent, that they cannot live without others, for example fruits need insects for the pollination, we need vegetables … all these species can be considered as parts of a more complex organism

orchestrated by a finality, which can be reached only through differentiation.

In human beings' cells cooperate towards greater ends and only in pathological situations, when they lose their end, they develop in an excessive way, suffocating other cells, as it happens with cancer.

At the beginning of evolution simple forms of life are the aim, then they become the foundation blocks for always higher forms of life. Species are not caused by previous species, but they are attracted towards future designs and forms.

Syntropy solves the profound dissymmetry that the second law of thermodynamics has introduced in

the universe, by considering all the solutions of the fundamental equations. The theory of syntropy shows that the solutions that physicists wanted to exclude represent exactly the essence of life phenomena, that seemed impossible to be explained.

Syntropy is capable of unifying different scientific disciplines in a harmonic way, opening in this way the road to a unified theory, a theory of everything that encompasses in a coherent theoretical framework all the manifestation of the universe.

With the formulation of the experimental method the problem of science was considered solved. This method considers causality at the

foundation of natural phenomena.

The experimental method is used to test cause and effect relations. In the case of positive results, the hypothesis is accepted, otherwise it is rejected. Experiments provide the verdict which allows to separate what is true from what is false.

The experimental method is profoundly different from the method which Aristotle suggested, which was useful in the formulation of theories but did not provide a way to choose among the various hypotheses.

The experimental method implies the law of causality and has limited scientific investigation to entropic phenomena. We can therefore call the

Galilean science an entropic science.

The experimental method is divided in three steps: observation, formulation of a theory, experimental validations of its hypotheses.

As we have previously seen each entropic phenomenon has a dual syntropic phenomenon and vice versa. Consequently, although it is impossible to use the experimental method to test directly a syntropic hypothesis, we can set up an experiment to test the dual entropic hypothesis. In this way the study of the syntropic phenomena can be done indirectly studying the dual entropic phenomena.

Syntropic scientists would therefore have to search for the dual entropic

phenomena, since when they manage to do this, it is possible to progress using the experimental method.

Let us apply this dual method to a phenomenon which has yet to be explained, such as the absorption of water and nutrients from the land and their rise in the higher parts of the plant.

The hypothesis of osmosis does not stand since plants also acquire salts from the land. The idea that capillary conducts are responsible for the rise of water also does not stand when we consider that some trees can reach the height of 150 meters. These phenomena of absorption of water and rise of water seem to contradict the entropic laws of physics and this

suggests that we are in front of syntropic phenomena which cannot be caused artificially. We can therefore apply to them the method of “dual experimentation”.

In order to obtain the dual entropic phenomenon, let us imagine that time flows in the opposite direction. We would see the lymph flow down until it reaches the roots and then water and salts disperse in the land. This dual image can be reproduced, for example, putting a non-living pole in the land and observing how water and salts filtrate from the top to the bottom and through the land. This entropic process of filtration, which can be easily caused in any moment proves that the process which we are

witnessing in plants is the dual process of filtration. We can therefore name it anti-filtration.

One may object that in filtration gravity helps the process. Well, when we change the direction of time also gravity changes and from an attractive force it becomes a diverging repulsive force which helps water rise in the anti-filtration process which we observe in plants.

Now, let us take the combustion of vegetal tissues. This is a phenomenon which we can cause at our will, and which is therefore certainly entropic. We see at the beginning a highly differentiated body, which is made of complicated carbon structures which absorbs oxygen from the air and when

burned emits carbon dioxide, water, heat and produces a red light.

When the time process is reversed shifting from entropic to syntropic we would expect carbon dioxide, water, heat and red-light frequencies to be absorbed. This would leave the complementary radiation to red which is green. If we look around, we will notice that this syntropic process of green color really exists. This is the chlorophyll process, in the green leaves of plants which absorb carbon dioxide, water and heat. The chlorophyll process is therefore the dual process to the entropic one of combustion.

Studying and determining the laws of combustion in our laboratories can

therefore allow us to account for the dual property of chlorophyll.

It is interesting to note that consciousness, the will, and human personality, are processes which are oriented towards the future, moved by finalities, and not causes. We can therefore state that psychical phenomena, our will, and personality can generally be considered syntropic phenomena. For this reason, they cannot be studied exhaustively using the experimental approach. It is also interesting to note that actions such as impulsive and emotional reactions which are caused by something that happened in the past are also those in which the activity of consciousness is reduced.

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.

The law of life is not 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 finalities, the law of syntropy. 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.

This suggests that the fundamental essence of life is love:

"I am not trying to be sentimental; I am just describing results which have been logically deducted from premises which are sure. 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.

We feel that the following words of Luigi Fantappiè can properly conclude this comment: *"[...] 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 finalities, 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 leveling 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. … 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 the major religions."[79]

[79] Fantappiè, L., *Conferenze Scelte*. Di Renzo Editore, Roma 1993

SUPERCAUSAL SCIENCE

Science (from Latin *scientia*, meaning knowledge) is a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions. An explanation is a set of statements which clarify the relations among causes, context, and consequences of facts. Explanations may establish rules or laws which allow to formulate predictions. Consequently, relations (among causes, context, and consequences) are at the basis of explanations and predictions and, when relations are studied in a replicable and objective

way, it is possible to talk about science.

In the last four centuries science has been using the experimental method, however syntropic methodology requires a different way to study relations which is generally known as the methodology of concomitant variations.

Let's start describing the experimental method.

The experimental method is based on the *methodology of differences*, which John Stuart Mill described in the following way:

> "*If an instance in which the phenomenon under investigation occurs, and an instance in which it does not occur, have every*

circumstance in common save one, that one occurring only in the former; the circumstance in which alone the two instances differ, is the effect, or the cause, or an indispensable part of the cause, of the phenomenon."[80]

The methodology of differences works as follows:

- two similar groups are formed (they are named the experimental and the control group).
- Treatment (the cause) is given only to the experimental group and all the other conditions are kept equal, so that the control group differs

[80] Mill J.S. (1843), *A System of Logic*, University of Toronto Press, 1843.

from the experimental group only for the treatment.

- Consequently, any difference observed between the experimental group and the control group can be attributed solely to the treatment, because only this condition changes between the two groups.

To have similar groups, randomization is used in the belief that it should distribute evenly all the intervening variables, between the experimental and the control group. But no controls are performed in order to verify if the condition of similarity is satisfied and often the experimental and control groups are

different ever since the beginning of the experiment. A single subject with extreme values can produce differences which are not due to the cause (ie treatment), but are due to the initial dissimilarity of the control and experimental groups.

To test the effect of a drug the experimental procedure is the following:

- two similar groups are formed, assigning subjects randomly to the experimental group or to the control group.
- The drug is given only to the experimental group, while all the other circumstances are left similar.

The control group is therefore given a placebo, a similar substance which has no effect.

– The differences observed between the two groups can be attributed solely to the effect of the drug.

Differences are the effect, and the drug (also called treatment) is the cause. The following conditions are required:

– To study differences between groups it is necessary that the effect can be *added* among the experimental subjects. For example, if a drug increases in some subjects the reaction times,

whereas in others subjects it reduces the reaction times, when adding these opposite effects, a null effect is obtained. The effect exists, but it is invisible to the experimental methodology based on the study of differences.

- Differences can be calculated only when using *quantitative data* (ie data which can be added together). On the contrary, qualitative data cannot be added and it is unsuitable when using the experimental method.
- All possible *sources of variability must be controlled*. It is important that nothing, besides the treatment (ie the cause), can influence the

variability of groups. For this reason, a controlled environment, which allows to keep alike all the possible sources of variability and in which each subject is treated exactly in the same way, is needed. Controlled environments require laboratory settings, which are very different from the natural context. The need for controlled settings limits the experimental method to analytical knowledge, detached from the context and from complexity.

– It is possible to study differences considering only one cause at a time or few causes when studying their interaction.

- When samples are small (less than 300 subjects), randomization does not guarantee the similarity of groups, and differences between groups may not depend on the treatment, but on the initial diversity of groups.

Common mistakes:

- Differences can be caused by single extreme values. Just one single outlier[81] can cause statistically significant results and lead to assert effects that do not exist. Outliers are often kept or removed to manipulate results.

[81] In statistics, an outlier is an observation that is distant from other observations.

- In statistics, data transformation refers to the application of a deterministic mathematical function to each point in a data set which is replaced with the transformed value. A common example are logarithmic transformations. In theory, any mathematical function can be used to transform the data set. Operating in this way, it is often possible to obtain differences between the two data sets, when there are no effects.
- When the effect shows in opposite directions, differences cannot be assessed, and the effect becomes invisible.

From a statistical point of view the methodology of differences uses parametric statistical techniques which compare mean and variance values, such as Student's t and the analysis of variance (ANOVA). These techniques require that effects can be added that data is quantitative and normally distributed (according to a Gaussian distribution), and groups are initially similar and are from the same population. But these requirements cannot be met in life sciences and parametric techniques end producing results that are inconsistent. It is therefore of no surprise that a study published on JAMA (Journal of the American Medical Association),

which revisited the results produced using the experimental method (ANOVA) and published in the period from 1990 to 2003 in 3 major scientific journals and cited at least 1,000 times, found that a study out of three was refuted by other experimental works. This finding raises serious doubts about the experimental method, when used in life sciences.[82]

In May 2011 Arrosmith published in the Journal Nature a study which shows that the ability to reproduce the results from phase 1 to phase 2 decreased in the period 2008-2010 from 28% to 18%, despite results

[82] Ioannidis J.P.A. (2005), *Contradicted and Initially Stronger Effects in Highly Cited Clinical Research*, JAMA 2005; 294: 218-228.

were statistically robust in phase 1 (phase 1 indicates studies conducted on small groups, generally not exceeding 100 subjects, whereas phase 2 indicates studies conducted on larger groups, usually not exceeding 300 subjects).[83]

Gautam Naik in the article "*Scientists' Elusive Goal: Reproducing Study Results*" published on the Wall Street Journal on December 2, 2011, points out that one of the secrets of medical research is that the majority of results, including those published in major scientific journals, cannot be reproduced.

Reproducibility is at the foundations

[83] Arrosmith J. (2011), *Trial watch: Phase II failures: 2008-2010*, Nature, May 2011, 328-329.

of making science and when results are not reproduced the consequences can be devastating.[84] Naik notes that researchers, particularly in universities, need to find positive results to publish and receive funding. In the December 23, 2010, article entitled "*The Truth Wears Off*," published in The New Yorker, Jonah Lehrer quotes a passage of a letter from a university professor, now an employee of a biotechnology industry:

> "*When I worked in a university lab, we'd find all sorts of ways to get a significant result. We'd adjust the sample size after*

[84] Only in the US the biomedical industry invests each year more than 100 billion dollars in research

the fact, perhaps because some of the mice were outliers or maybe they were handled incorrectly, etc. This wasn't considered misconduct. It was just the way things were done. Of course, once these animals were thrown out [of the data] the effect of the intervention was publishable."

There is plenty of evidence that the massive financial incentives lead to the suppression of negative results and the misinterpretation of positive ones. This helps explain, at least in part, why such a large percentage of randomized clinical trials cannot be replicated."

The methodology of concomitant variations

In 1992 physicists at LEP (Large Electron-Positron Collider in operation at CERN in Geneva) could not explain some annoying fluctuations in the beams of electrons and positrons. Although very small, these fluctuations created serious problems when the energy of the rays must be measured with great precision. The experimental method did not provide any clue and in order to solve the dilemma the methodology of concomitant variations was used in order to test different hypotheses. Results showed the concomitant fluctuation in the energy of the particle beams of LEP and the tidal force exerted by the

Moon. A more detailed analysis showed that the gravitational attraction of the Moon distorts very slightly the vast stretch of land where the circular tunnel of LEP is recessed. This tiny change in the size of the accelerator caused fluctuations of about 10 million electron volts in the energy rays.

The methodology of concomitant variations uses double entry tables of dichotomous variables. In the following table the concomitance of the variable sex and car accidents is difficult to assess since the total value of each column differs.

Accidents	Males	Females	Total
No	50	105	155
Yes	200	45	245
Total	250	150	400

Concomitances between sex and car accidents
(Data invented for this example)

When the absolute frequency values are converted into column percentage values it becomes easy to compare the columns "Males" and "Females".

We see a strong concomitance between "*Males*" and "*Accidents*" (80%) and between "*Females*" and "*No accidents*" (70%). Concomitances are assessed according to the differences between observed frequencies (column percentage) and expected frequencies (percentages in the total

column). For example, the expected percentage for "*no accidents*" is 39%, whereas in the "*females*" column we have 70%.

Accidents	Males	Females	Total
No	50	105	155
	20%	70%	39%
Yes	200	45	245
	80%	30%	61%
Total	250	150	400
	100%	100%	100%

Concomitances between sex and car accidents
(Columns percentages)

Since being male is determined before accidents take place, we can fall in the error of stating that being

male is the cause of car accidents. However, this methodology allows to study intervening variables by splitting the table in two. For example, we can split the previous table in two groups: those who drive little and those who drive a lot:

Drive:	***Little***		***A lot***	
Accidents	**Males**	**Females**	**Males**	**Females**
No	70%	70%	20%	20%
Yes	30%	30%	80%	80%
Total	100%	100%	100%	100%

Concomitances between sex, km driven and car accidents

In this table the concomitances between sex and accidents disappears. The correlation "*males-accidents*" is therefore mediated by the variable

"*number of kilometers driven*", which is therefore an intervening variable. Consequently, the relation becomes "*males drive a lot and consequently are involved in more accidents*." Crossing three variables at a time allows to identify intervening variables and to study the context within which relations are valid. For example, when a concomitance is found between a drug and healing it is possible to study if it is true always, or only at certain conditions, such as specific age groups, sex, habits, and other conditions.

The advantages of the methodology of concomitant variations are:

- It uses dichotomous variables. Any information, quantitative or qualitative, objective, or subjective can be transformed into one or more dichotomous variables. As a result, it permits to keep track of all the elements of the phenomena.
- It allows the study of many variables at the same time, thereby it can consider the complexity of the phenomena. In contrast the experimental method can study only one or a limited number of variables at a time, thereby it produces knowledge which is detached from the context and the complexity of natural phenomena.
- It allows to control for intervening

and spurious variables, and this is done after and not before. Therefore, it does not always need controlled environments such as a laboratory and it is possible to use natural contexts.

– With subjective answers people often respond using masks. For example, even when we feel unhappy, lonely, depressed, usually we try to give an image of ourselves (a mask) which is positive. With the experimental method masks constitute a problem which is insurmountable, and which is solved only by removing qualitative and subjective information from the analyses. On the contrary, the

methodology of concomitant variations can correctly handle responses which are masked.

This happens because a property of masks is that they affect not only one variable, but all those which are correlated. For example, if a person responds by saying no to "*I feel depressed*," when he is depressed, he will also say no to "*I feel unhappy*," when he is unhappy. The concomitance between depression and unhappiness remains unchanged because both responses have moved in the same direction and continue to remain correlated.

Unhappy	Depressed		Total
	Yes	No	
Yes	15	3	18
No	2	***180***	182
Total	17	183	200

Concomitances between masked answers

This table shows that the two modalities, "*I feel happy*" and "*I do not feel depressed*", are concomitant.

When using psychological tests, which produce "objective" measurements of depression and happiness which are not distorted by the effect of masks, answers shift from the positive to the negative side. But the result remains unchanged:

Unhappy	Depressed		Total
	Yes	No	
Yes	***158***	10	168
No	2	30	32
Total	160	40	200

Concomitances obtained when using "objective" information

Results continue to show the concomitance between the variables depression and unhappiness.

This means that if a concomitance exists it will show also when responses are masked, since masks are applied in a coherent way to all those variables which are correlated. This is a fundamental point, as the problem of masks is ubiquitous in

psychological, social, and economic sciences. The methodology of concomitant variations solves this problem and allows in this way to widen science to subjective and qualitative data and allows the methodology of concomitant variations to use direct questions, such as: "*do you feel depressed?*"

Statistics

When using the methodology of concomitant variations, the first thing we must do is to define which is the "statistical unit." Statistical units allow the study of concomitances among variables and the choice of the

statistical unit is strictly related to the aim of the research. Units can be persons, animals, plants, manufactured items, organizations.

With the methodology of differences units are in a one-to-one correspondence with the data values, whereas with the methodology of concomitant variations there is a one-to-many correspondence since unlimited data values can be collected for each unit.

Sample requirements differ according to the methodology and aim:

- When the aim is to make inferences about the population from the

sample, the sample must be representative of the population. This is usually achieved by random sampling.

- When the aim is to study differences among the experimental and the control group the sample must be homogeneous. This is usually achieved by randomly distributing the units across the experimental and control group. If the aim is to assess the effect of a new drug against a placebo drug, then the patients should be allocated to either the drug group (experimental) or to the placebo group (control) using

randomization. Randomization reduces biases by equally distributing factors that have not been explicitly accounted for. When randomization does not allow for the formation of homogeneous groups, the alternative is to use laboratory animals, purposely bred to guarantee homogeneity. Laboratory animals are euthanized after being used once, since their use in one experiment makes them different and unsuitable for other experiments.

– When the aim is to study concomitant variations among variables, the sample must be

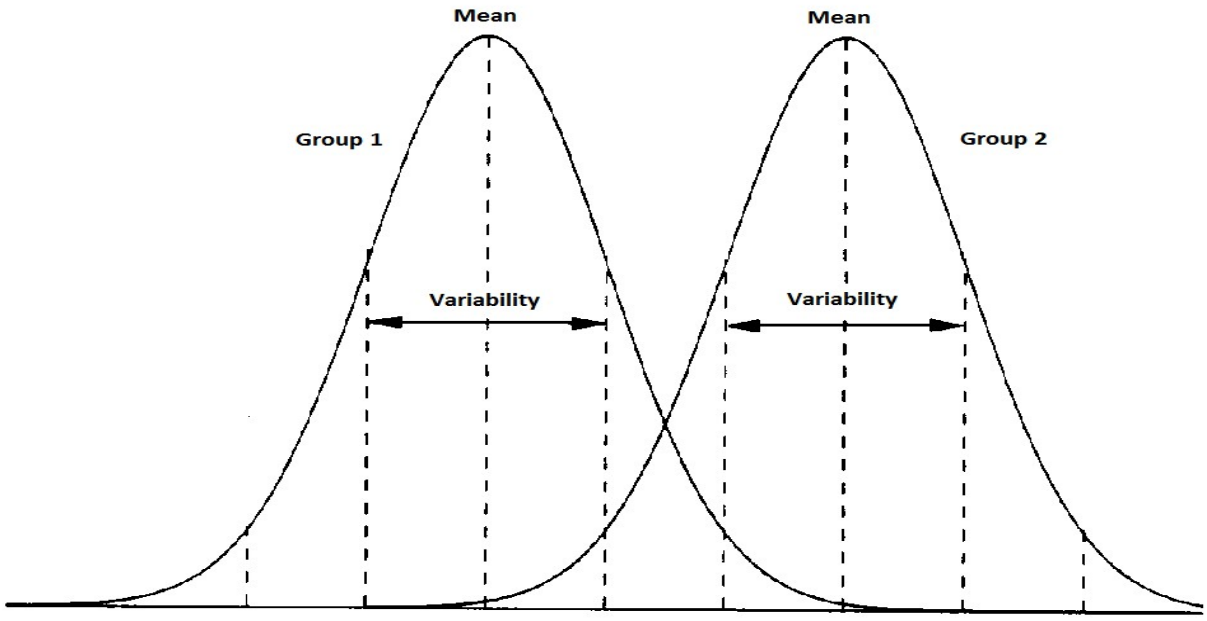
heterogeneous. If the aim is to study which factors cause drug addiction, we will include in the sample subjects with different levels of drug addiction. The definition of the sample is therefore strictly related to the aim. With the methodology of concomitant variations, it is important to keep track of all the possible intervening variables and check later for intervening and spurious relations.

The methodology of differences assesses effects by:

– comparing the difference between

mean values of the experimental and control groups with the variability of the values in the sample.

– or by comparing the variance between groups with the variance within groups.



Comparison of mean and variability of two groups

Initial similarity between groups is a fundamental requirement, without

which it is impossible to state that the difference observed between the experimental and the control group is a consequence of the cause/treatment. But, in clinical trials the variability of subjects can be so great that even increasing the sample size does not lead to statistically significant results.

When this is the case laboratory animals are used. Laboratory animals are all very similar and decrease the variability of the sample, allowing in this way small differences to become statistically significant.

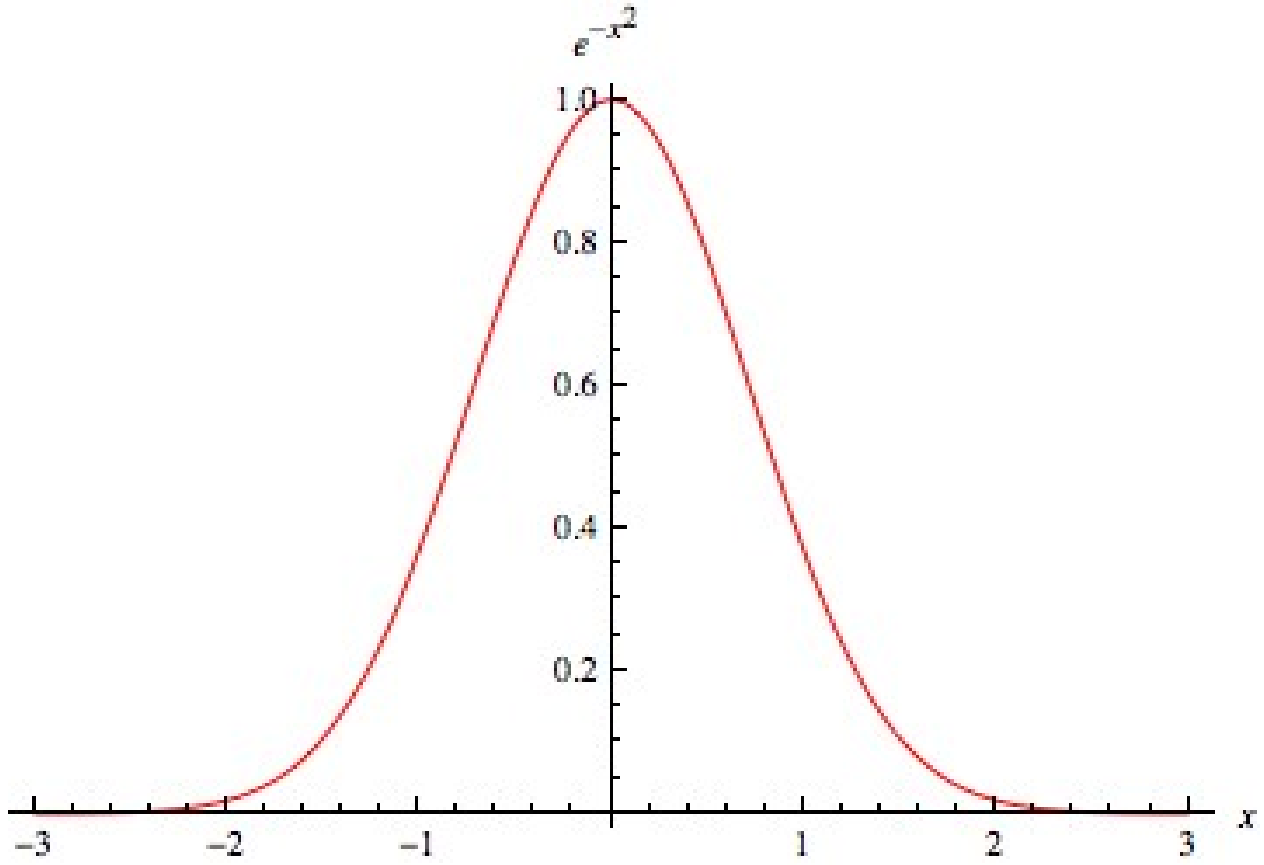
There is now mounting evidence that animal experimentation

constitutes an artifact.[85] The reason is very simple. Statistical significance is stronger when the variability is smaller. Consequently, when the effect size is small, the only way to obtain statistically significant results is to reduce the variability of the sample. When using animals, which are all very similar, the variability of the sample tends to be null, and consequently also insignificant differences become statistically significant. In other words, animals are too similar and differences that have no actual value become significant. Furthermore, one of the

[85] In experimental science, the expression 'artifact' is used to refer to experimental results which are not manifestations of the natural phenomena under investigation, but are due to the particular experimental arrangement, and hence indirectly to human agency.

fundamental rules in science is to use samples that are representative of the population to which results will be generalized. It is obvious that laboratory animals are not representative of humans and that the effects observed using laboratory animals are difficult to generalize to humans.

Finally, the methodology of differences uses parametric statistical techniques, which require data distributed according to the Gaussian curve. This condition is usually not met, nevertheless researchers go on and interpret results.



Gaussian distribution

Concomitances require variability: heterogeneous samples, where variability is maximized. The methodology of differences requires homogeneous samples, whereas the methodology of concomitant variations requires heterogeneous samples.

For example, with the methodology

of concomitant variations, in a study that aims to compare the growth of 5 different types of crops in 5 different types of field, all the combinations will be considered (5! = 120 possible combinations) and at least 30 measurements will be taken for each combination. Since the aim is to compare growth rates, the statistical unit will be the height of the crop after a fixed interval of days (or a similar type of measurement). For each measurement an array of information will be traced, such as the type of field and the type of crop, secondly information that we think can be related to the growth of crop. At the end we will have 3600 records (30 measurement x 120 combinations),

each with data on the growth rate and an array of other information.

When answers tend to concentrate in one modality, wider measuring scales are needed. For example, when we ask "*Do you feel depressed?*" yes/no, most people answer no and this little variability limits the possibility of studying concomitances. In order to restore variability it is necessary to use wider scales, such as "*How much do you feel depressed?*" *0,1,2,3,4,5,6,7,8,9,10*. Most answers will concentrate in the low values, 0 to 3, and the median cut-off point will probably be between the values 1 and 2. The aim of the methodology of concomitant variations is to study relations maximizing the variability.

Usually at least 100 units (ie subject/records/forms) are required. But, in many clinical studies only one subject is available. When this is the case, measurements can be repeated in different moments, trying to maximize the variability. For example, if we want to study what is concomitant to our headaches, we keep track at regular intervals of all what we think might be related to this situation. For example, each evening we fill a form in which we provide a subjective measurement of the headache, plus what we ate, what we watched on TV, our feelings, etc. When enough forms (possibly more than 100) are filled we can process them.

Data can be collected in various ways: nominal, ordinal, interval and ratio.

- *Nominal* or categorical data are made of mutually exclusive modalities. For example: marital status, nationality.
- *Ordinal* data are variables where the order matters but not the difference between values. For example, if we ask patients to express the amount of pain, they are feeling on a scale of 0 to 10. A score of 7 means more pain than a score of 5, and 5 is more than a score of 3. But the difference between 7 and 5 may not be the

same as that between 5 and 3. The values simply express an order, a progression.

- *Interval* data are variables where the difference between two values is meaningful. For example, the difference between 1 meter and 2 meters is the same difference as between 3 and 4 meters. That is, numbers are spaced always by the same measuring unit.
- *Ratio* data have all the properties of interval variables but have also a clear definition of the zero value. Variables like height, weight, enzyme activity are ratio variables. Temperature, expressed in Fahrenheit or Celsius, is not a ratio

variable. A temperature of zero degrees on either of those scales does not mean no temperature. Kelvin degrees correspond instead to a ratio variable since zero degrees Kelvin really correspond to no temperature. When working with ratio variables, but not interval variables, it is possible to use divisions. A weight of 4 grams is twice a weight of 2 grams, because weight is a ratio variable. A temperature of 100 degrees Celsius is not twice as hot as 50 degrees Celsius, because temperatures in Celsius are not a ratio variable. The Celsius scale is an interval variable, whereas the Kelvin scale starts from absolute zero and allows for

ratios.

The mathematical operations which can be performed are:

- in the case of nominal/categorical variables the value is a modality of a list, for example Italy France, Germany. With these variables it is possible only to count the occurrences of the modalities.
- In ordinal variables the value is a sequence: First, Second, Third; Elementary education, High School, University. It is possible to divide the sequence into high and low, for example high education, low education, or treat each value

as a modality (nominal variable). For example, it is possible to count how many people have reached secondary or higher education. It is possible to find which is the level of education attained at least, for example, by 50% of the population. There is an order, a progression, which can be used to create new categories (e.g. low education and high education) or to order the population. Ordinal variables allow for counting and sorting.

- Interval variables allow to calculate average values and variabilities since they permit the use of additions and subtractions.
- Ratio variables use the absolute

zero value and allow to use divisions and multiplications.

Data can be transformed in one or more dichotomous variables.

- In the case of nominal variables, the single modality (i.e., single province, nationality, color) can be translated into a dichotomous variable. For example, Italy becomes the Italy dichotomous variable for which the answers can only be yes or no.
- Ordinal variables follow a progression. These variables can be treated in the same way as the nominal variables by translating

each modality in a dichotomous variable, but it is also possible to translate the information in the form high/low. It is important to note that there is no objective criterion for defining when modalities are considered high or low. For example, in a study concerning university professors the lowest degree of education might correspond to the highest degree in another study which considers the poor population of developing countries. The division of an ordinal variable into a dichotomous variable, must always consider the context and purpose of the study. If no criterion suggests how to divide between

high and low the cut-off point is chosen by balancing the two groups. This is done using the median value.

- When dealing with interval or ratio variables cut-off values, that mark the transition from low to high values, are generally used. The aim of the researcher and the purpose of data analysis is usually to identify these cut-off values. It happens frequently that the same variable can be translated into multiple dichotomous variables to test which cut-off value best allows to identify a critical value, i.e., a value that indicates the transition from one state to another.

Data is the row material, but not all data is suitable for concomitant variations analyses; only data which can be transformed in the dichotomous form and is gathered in a systematic way can be used. Information which cannot be coded or transformed in the dichotomous form is of little use.

In the late 19th century, Charles Sanders Peirce in "*How to Make Our Ideas Clear*"[86] placed induction and deduction in a complementary rather than competitive context. Secondly, and of more direct importance to scientific method, Peirce put forth the

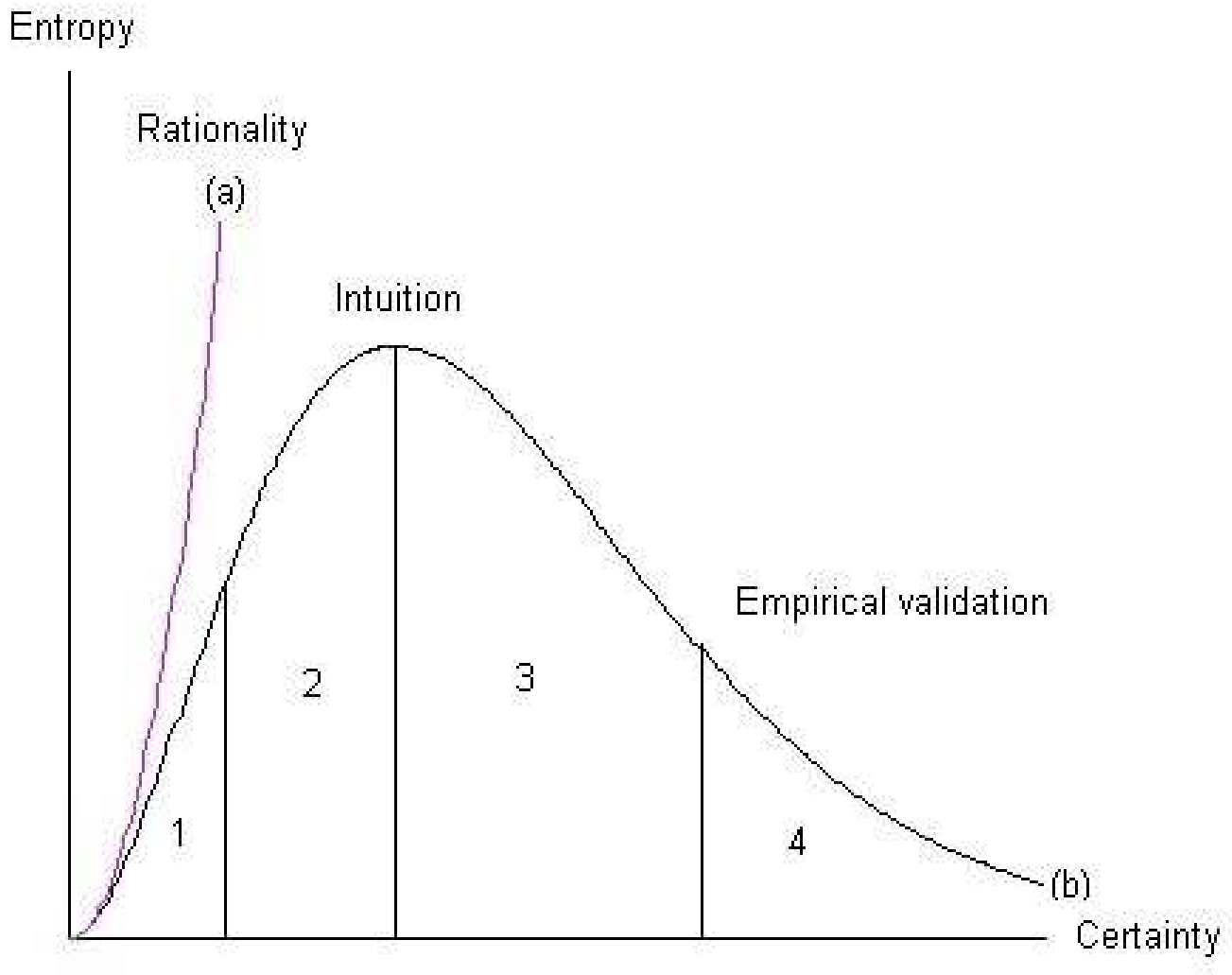
[86] Peirce C.S. (1878), How to Make Our Ideas Clear, www.amazon.it/dp/B004S7A74K

basic schema for hypothesis-testing that continues to prevail today. Peirce examined and articulated the fundamental modes of reasoning that play a role in scientific inquiry, the processes that are currently known as abductive, deductive, and inductive inference:

- During the *inductive* phase we consciously review the know-how and unsolved problems.
- During the *abductive* phase unconscious processes take place and lead to intuition which highlights new hypotheses and solutions.
- During the *deduction* phase

hypotheses are translated into items.

– During the *validation* phase data is gathered and hypotheses and solutions are tested.



Phases of the process of discovery

One of the most delicate phases is

when we translate hypotheses into items (phase 3).

Hypotheses always state a concomitance between two or more variables. To test these concomitances, it is required to gather data separately. For example, if the hypothesis is that loneliness causes anxiety it is wrong to ask: *Loneliness causes anxiety*? because the concomitance between loneliness and anxiety is already given in the item and data analysis will not be able to tell if this concomitance exists.

To study the concomitance between loneliness and anxiety it is necessary to formulate two different items: *Do you feel lonely*? *Do you experience anxiety*?

Data analysis will tell if these two

items (loneliness and anxiety) vary in a concomitant way and are related. It is also important to ask information in a clear and direct way, avoiding negative forms. Each item should contain only one information.

For example, the following item is incorrect since it combines State Aid (Yes/No) with Family type (one parent family, two parents family):

Did the family receive State Aid?

- ☐ Yes, No,
- ☐ It is a one parent family,
- ☐ It is a two parents family

The correct formulation is:

Did the family receive State Aid? Yes, No

Family type: One parent, Two parents

Each item (i.e., each variable) must be relative only to one type of information. During data analysis information will be combined and concomitances will be studied.

Items can be divided into key items, explicative and structure items:

- *key items* are all those variables which describe the topic under investigation, for example if the study is relative to cancer, key variables will be relative to cancer.
- *explicative items* are all those variables which might be correlated

(linked) to the key variables, for example in the case of cancer it could be the environment, stress, food, and so on.

– *structure items* are variables such as age, sex, education, profession; variables which are usually used to describe the sample of the study and the context.

To choose relevant explicative variables, it can be useful to ask the help of experts who have a good knowledge of the subject. It is also useful to compare different hypotheses. Scientific research is a process of continuous evolution of knowledge which requires the

disposition to revisit, change and eventually abandon our beliefs.

Designing a form can be divided in the following steps:

- declare which is the aim of the study (*key variables*).
- list all those variables (*explicative variables*) which might be correlated (concomitant) to the key variables. It is very important to keep track of the hypotheses, in this way the interpretation of the results will be straightforward, otherwise it is easy to fall in the trap of paying too much attention to secondary information and produce interpretations which are totally

irrelevant and of little scientific value. It is always a good habit to use more items for the same information (redundancy).

– prepare the form (questionnaire, observation grid, …) and test it to assess if it works well or if it can be improved and optimized. It is necessary to continue testing the form until it reaches a standard which we consider acceptable.

Parametric statistical tests assume that the variables data in the population are distributed according to the normal (Gaussian) distribution, which in probability theory is a continuous distribution, a function,

which allows to calculate the probability that any real observation will fall between any two limits.

On the contrary, nonparametric methods make no assumptions about the distribution of data. Their applicability is much wider than the corresponding parametric methods and, due to the reliance on fewer assumptions, are more robust and simpler. Even when the use of parametric methods is justified, nonparametric methods are easier to use and more reliable. Because of their simplicity, results leave less room for improper use and misunderstanding.

In the 1960s Simon Shnoll and co-

workers were probably the first scientists to show that the assumption of the normal distribution is only mathematical, and that in life sciences and in physics it is false.

In a review of studies performed over more than forty years, Shnoll[87] shows the non-randomness of the fine structure of the distributions of measurements, starting from biological objects and moving into the purely physical domain. The implication is huge: tests based on the assumption of normal random distributions, such as those in the field

[87] Shnoll SE, Kolombet VA, Pozharskii EV, Zenchenko TA, Zvereva IM and AA Konradov, Realization of discrete states during fluctuations in macroscopic processes, Physics – Uspekhi 162(10), 1998, pp.1129–1140. http://ufn.ioc.ac.ru/abstracts/abst98/abst9810.html#d

of parametric statistics, are fundamentally biased and produce results which are often unstable and difficult to reproduce.

The methodology of concomitant variations uses nonparametric statistics, among which the Chi Square (χ^2) is today one of the most widely used statistical indexes. χ^2 calculates the differences between observed frequencies and expected frequencies. In the absence of concomitances χ^2 is equal to 0, whereas in the case of maximum concomitance it is equal to the size of the sample.

The comparison with the χ^2 probability distributions allows to

know the statistical significance of the concomitance. Statistical significance indicates the risk which is accepted when we state the existence of the relation. Conventionally concomitances are taken in consideration when the risk is below 1%.

With dichotomous variables concomitances can be accepted with a risk lower than 1%, with χ^2 values greater or equal to 6.635.

When using the methodology of concomitant variations all variables are translated into the dichotomous form. Crossing two dichotomous variables produces a 2x2 table. If we take, for example, the following variables **A** and **B**:

B	A		Total
	Yes	No	
Yes	18,340	3,241	21,581
No	5,118	29,336	34,454
Total	23,458	32,577	56,035

the χ^2 value is obtained by comparing the observed frequencies and the expected frequencies.

Expected frequencies are calculated by dividing the product of the total values of row and column by the general total. For the expected frequency of the first cell (Yes / Yes) is:

$$21{,}581 \times 23{,}458/56{,}035 = 9{,}034$$

Following this procedure for all the cells of the table we have the following expected frequencies table:

B	A		Total
	Yes	No	
Yes	9,034	12,547	21,581
No	14,424	20,030	34,454
Total	23,458	32,577	56,035

The Chi Square formula is the following:

$$Chi\ Square = \sum \frac{(f_o - f_e)^2}{f_e}$$

where f_o indicates observed frequencies and f_e expected frequencies

For each cell we calculate the square of the difference between observed frequencies and expected frequencies divided by expected frequencies and we sum the results together.

In this example we obtain a Chi Square value of 26,813, well above the value 6.635 from which the statistical significance of 1% starts.

Since the maximum value of χ^2 varies depending on the number of cases, it is useful to standardize it between 0 and 1. This transformation is known as the *rPhi* and is obtained as the square root of the value of χ^2 divided by the sample size and behaves similarly to Pearson's correlation index.

Correlations/concomitances can be

of two types: direct or inverse. If the correlation is directed the two dichotomous variables are concomitantly true or false, whereas if the correlation is inverse one variable is true when the other is false.

Inverse correlations have negative sign (-), whereas direct correlations are shown without sign.

Software

The Sintropia-DS software was developed to make the methodology of concomitant variations available. A complete description is available in the help sections of the software, or in the dedicated 2005 issue of the

Syntropy Journal.[88]

The first version of Sintropia-DS dates back to 1982, it was distributed with the name DataStat, and extensively used in the Department of Statistics of the University of Rome. Sintropia-DS merges database and statistical analyses (this is the reason of the extension DS: database and statistics).

To install Sintropia-DS in your computer: download the zip file from

www.sintropia.it/sintropia.ds.zip

copy the folder "Sintropia.DS" from the zip file in the root disk "C:" and find the Sintropia application in the folder Sintropia.DS.

Since this version of the software

[88] www.sintropia.it/journal

dates to 2005 and was developed for Windows-XP, recent version of Windows require that you allow the use of the program.

SUPERCAUSALITY AND QUANTUM MECHANICS

At the end of the 19th century Lord Rayleigh and Sir James Jeans extended the equipartition theorem of classical statistical mechanics to an ideal black body at thermal equilibrium and were faced with a fundamental paradox.

According to the equipartition theorem a black body at thermal equilibrium (which in physics is the best possible emitter of thermal radiation) will emit radiation with infinite power as it would all concentrate in the ultraviolet

wavelength.

This prediction was named the *ultraviolet catastrophe*, but fortunately it was not observed in nature.

The paradox was solved on 14 December 1900 when Max Planck presented a paper, at the German Physical Society, according to which energy is quantized.

Planck assumed that energy does not grow or diminish in a continuous way, but according to multiples of a basic quantum, which Planck defined as the frequency of the body (ν) and a basic constant which is now known to be equal to $6{,}6262 \cdot 10^{-34}$ joule·seconds and which is now named Planck's constant.

Planck described thermal radiations as made of packets (quantum), some small and others larger according to the frequency of the body. Below the quantum level, thermal radiation disappeared, avoiding in this way the formation of infinite peaks of radiation at the ultraviolet wavelength and solving in this way the paradox of the ultraviolet catastrophe.

December 14, 1900 is now remembered as the starting date of quantum mechanics.

Quantum theory was further confirmed by Einstein with the study of the photoelectric effect.

When light or electromagnetic radiation reach a metal, electrons are

emitted, this is named the photoelectric effect. The electrons of the photoelectric effect can be measured, and these measurements show that:

- until a specific threshold is reached the metal does not emit any electrons.
- above the specific threshold electrons are emitted, and their energy remains constant.
- the energy of the electrons increases only if the frequency of light is raised.

Classical light theory was not able to justify this behavior:

- Why does the intensity of light not increase the energy of the electron emitted by the metal?
- Why does the frequency affect the energy of the electrons?
- Why are electrons not emitted below a specific threshold?

In 1905, Einstein answered these questions using Planck's constant and suggesting that light, previously considered an electromagnetic wave, could be described as quantum packets of energy, particles which are now called photons.

Einstein's interpretation of the photoelectric effect played a key role

in the development of quantum mechanics, as it treated light as particles, instead of waves, opening the way to the duality wave/particles.

The experimental proof of Einstein's interpretation was given in 1915 by Robert Millikan who, ironically, had been trying, for 10 years, to prove that Einstein's interpretation was wrong. In his experiments Millikan discovered that all the alternative theories did not pass the experimental test, whereas only Einstein's interpretation was shown to be correct.

Several years later Millikan commented:

"I spent ten years of my life testing that 1905 equation of Einstein's and contrary to all my expectations I was compelled in 1915 to assert its unambiguous experimental verification in spite of its unreasonableness since it seemed to violate everything that we knew about the interference of light."

Planck himself remained skeptical of his own discovery failing to answer the question "*why quantum*?" This question has not yet received an answer and remains one of the fundamental mysteries of quantum mechanics.

Syntropy suggests that atoms vibrate between diverging and converging phases. In the diverging phase, atoms can emit a packet (quantum) of

energy, whereas during the converging phase they can absorb a quantum. In the diverging phase entropic energy is accessible, whereas in the converging phase syntropic energy is accessible.

This vibrating interpretation of the atom can answer several questions. For example, according to the second law of thermodynamics, particles (such as the electron) should rapidly lose their kinetic charge and fall towards the center of the atom. This does not happen.

Syntropy suggests that atoms vibrate in infinite cycles of expansion and contraction, in which the effect of entropy is counterbalanced by syntropy during the converging phase.

In this interpretation the wave/particle duality is the manifestation of the duality: causality/retrocausality, entropy/syntropy. Where causation is deterministic and retrocausality is probabilistic. Two types of causality united by the same energy and coexisting in every manifestation of matter.

But the negative energy time solution was impossible since it introduces retrocausality and the possibility of perpetual motion in physics (perpetual motion is though observed in atoms!).

To avoid retrocausality Einstein argued that the momentum is negligible, since the motion of bodies

is practically nil, when compared to the speed of light. When the momentum is set equal to zero (p=0), the energy momentum mass equation simplifies into the famous $E=mc^2$, which always has positive solution, without any reference to the direction of time.

In 1924 Wolfgang Pauli, one of the pioneers of quantum mechanics, discovered that electrons have a spin, a momentum which nears the speed of light. As a result, it was necessary to combine quantum mechanics and special relativity, using the $E^2=m^2c^4+p^2c^2$ formula and not the simplified $E=mc^2$.

In 1925 the physicists Oskar Klein and Walter Gordon formulated the

first equation that combined quantum mechanics and special relativity and found themselves with two solutions: one that describes matter and energy that propagate forward in time, and the other describing matter and energy that propagate backward in time (now known as antimatter).

In 1926 Erwin Schrödinger removed the energy/momentum/mass equation from Klein and Gordon's equation obtaining in this way his famous wave function (Ψ).

In 1927, Klein and Gordon formulated again their equation as a combination of Schrödinger's wave function and the energy/momentum/mass equation.

The equation of Klein and Gordon

manages to explain the mysteries of quantum mechanics, such as the duality wave/particle which would result from the duality causality/retrocausality. However, Niels Bohr and Werner Heisenberg considered retrocausality unacceptable. Starting from the Schrödinger equation, which treats time in the classic time-forward way, they suggested what is now known as the Copenhagen interpretation of quantum mechanics, which states that matter propagates as a wave and only when it is observed the wave collapses into a particle. But the act of observing is an act of consciousness. In this way Bohr and Heisenberg gave to consciousness the power to create

reality. This interpretation fitted the Nazi ideology, which stated that men are endowed with powers of creation.

When Erwin Schrödinger discovered how Heisenberg and Bohr had used his equation, with ideological and mystical implications, he commented: "*I don't like it, and I am sorry I ever had anything to do with it*."

In 1928, Paul Dirac, tried to solve the dispute by applying the $E^2=m^2c^4+p^2c^2$ equation to the electron. To his disappointment, he obtained two solutions: the electron and the neg-electron, where the electron moves forward in time and the neg-electron backward in time.

The neg-electron caused emotional distress. For example, Heisenberg

wrote to Pauli: "*The saddest chapter of modern physics is and remains the Dirac theory … I regard the Dirac theory as learned trash which no one can take seriously.*"

In 1931, to remove the unwanted retrocausal solution, Dirac used Pauli's principle, according to which two electrons cannot share the same state, to suggest that all states of negative energy are occupied, thereby forbidding any interaction between forward-in-time and backward-in-time states of matter. On this assumption of an ocean of negative energy, called the Dirac Sea, the more recent "Standard Model" of physics continues to be based.

However, in 1932 Carl Anderson

discovered neg-electrons in cosmic radiations and named them positrons, thus paving the way for the study of antimatter.

The scientific debate between special relativity and quantum mechanics was soon poisoned by political passions. In April 1933 Einstein learned that the new German government had passed a law excluding Jews from holding any official positions, including teaching at universities. A month later, the episode of the burning of books by the Nazis occurred, with Einstein's works being among those burnt, and Nazi's propaganda minister Joseph Goebbels proclaimed, "*Jewish intellectualism is dead*." Einstein's name was on a list of assassination targets,

with a *"$5,000 bounty on his head"* and one German magazine included him in a list of enemies of the German regime with the phrase, "*not yet hanged.*" Einstein's treatises were burned, his suburban villa in Berlin was raided, and his furniture, books, bank account and even his violin were seized. Hitler's ideological convictions about Jewish science had received support from the book "*100 Authors against Einstein.*"[89] The theory of relativity was stigmatized as Jewish science, deliriums of a crazy Jew whereas the Copenhagen interpretation was imposed.

[89] Israel H (1931), Ruckhaber E e Weinmann R, Hundert Authoren gegen Einstein, Voigtlanders, Peipzig, 1931.

Non-locality

In the Copenhagen Interpretation, the collapse of the wave function (wave collapsing into particles) occurs at the same moment in all the points of the wave. This implies an instantaneous propagation of information that violates the limit of the speed of light that Einstein considered the upper limit for the propagation of information and causality.

Einstein considered causality always local, and speeds had always to be lower or equal to that of light, but never faster.

Starting from these assumptions

Einstein rejected the idea that the information of the collapse of the wave function could propagate instantaneously and, in 1934, he formulated the EPR paradox which was named from the initials of the persons who formulate it (Einstein-Podolsky-Rosen).

EPR started from Pauli's discovery that electrons have a spin and that the same orbit can be shared by only two electrons with opposite spins (the Pauli exclusion principle). The Copenhagen Interpretation concludes that electron pairs which shared the same orbital remain correlated (entangled) showing always opposite spins, regardless of their distance, thus violating the limit of the speed of light

in the propagation of information.

The EPR paradox remained unanswered for more than 50 years and was considered as a thought experiment, to demonstrate the absurdity of the Copenhagen Interpretation, raising a logical contradiction.

No one expected that the EPR experiments could be carried out, however, in 1952 David Bohm suggested to replace electrons with photons, and in 1964 John Bell showed that this change opened the way to the experiment.

However, at that time, not even Bell believed that the experiment could be done. But scientists accepted the challenge and in 1982 the team of

Alain Aspect, published the results that show that Einstein was wrong.[90]

The quantum property measured by Aspect is the polarization of the photon, which can be imagined as an arrow which points upwards or downwards.

We can stimulate an atom to produce two-photon simultaneously, which are sent in two different directions. The polarizations of the two photons must be opposite: if the arrow in the first one goes up, the other must go down. Each photon leaves with a well-defined polarization, and the coupled photon with the opposite polarization. Both retain their

[90] Aspect A (1932), Experimental Realization of Einstein-Podolsky-Rosen-Bohm, Gedankenexperiment, Physical Review Letters, vol. 49, 91, 1982.

polarization in their journey through space.

The Copenhagen Interpretation states that any quantum entity with this dual possibility exists in a superposition of states, until its polarization is not measured, and the wave function collapses. Only after the wave function collapses the counterpart of the photon that is measured must show the opposite arrow direction. At the precise moment in which the measurement of the photon is performed, the collapse of the wave forces photon B (which could, in principle, be on the far side of the universe) into the opposite state. The instantaneous response of photon B to what happens to photon

A is what Einstein called the "*spooky action at a distance*."

The experiment made by Aspect measured the polarization according to an angle, which can be varied, with respect to upward and downward arrows. The probability that a photon with a certain polarization will pass through a filter arranged with a certain angle depends on its polarization and the angle between the polarization and the filter. In a non-local reality changing the angle with which the polarization of the photon A is measured will necessarily alter the probability that the photon B passes through a polarizing filter arranged at a different angle. In addition, the experiment not only considers two

photons, but entire beams of photons, or series of related pairs whizzing through the apparatus one after the other.

Bell had shown that if Einstein was right the number of photons that go through the B polarizing filter had to be lower than that which passes through filter A. This takes the name of Bell inequality. However, Aspect's experiment proved the opposite, that the first value (A) is always lower to the second value (B). To put it in other words, Bell inequality is violated, and the common sense embodied by Einstein lost the challenge.

Although Aspect's experiment was motivated precisely by quantum theory, Bell's theorem has much

broader implications and the combination of Bell's theorem and the experimental results reveals a fundamental truth of the universe, that there are correlations which take place instantly, regardless of the distance between objects, and that signals seem to be able to travel at speeds exceeding that of light.

As a result of the EPR paradox and the results of Aspect's on non-locality and entanglement, quantum mechanics and special relativity are generally considered to be incompatible even if both are accurate in predicting the results of the experiments.

The conflict between quantum

mechanics and special relativity unravels when we accept the possibility of retrocausality: effects that can propagate backwards in time, and that can occur instantaneously in space, and travel at speeds which exceed that of light.

In his book "*The Road to Reality*" Roger Penrose underlines that usually physicists tend to reject as "unphysical" any solution which contradicts classical causality, according to which causes always precede effects. Any solution which makes it possible to send a signal backward-in-time is usually rejected.

Even if Penrose chose to reject the negative time solution of the energy equation, he states that this refusal is a

consequence of a subjective choice, towards which other physicists have different opinions.

Penrose dedicates nearly 200 pages of his book to the paradox of the negative time solution. According to Penrose it is important that the value of E is always positive because negative values of E lead to catastrophic instabilities in the Standard Model of sub-atomic physics.

"*Unfortunately, in relativistic particles both solutions of the equation need to be considered as a possibility, even a non-physical negative energy has to be considered as a possibility. This does not happen in non-relativistic particles. In this last case, the quantity is*

always defined as positive, and the embarrassing negative solution does not appear."[91]

Penrose adds that the relativistic expression of Schrödinger's equation (i.e., the equation of Klein Gordon) does not offer a clear procedure to exclude the backward-in-time solution of the square roots.

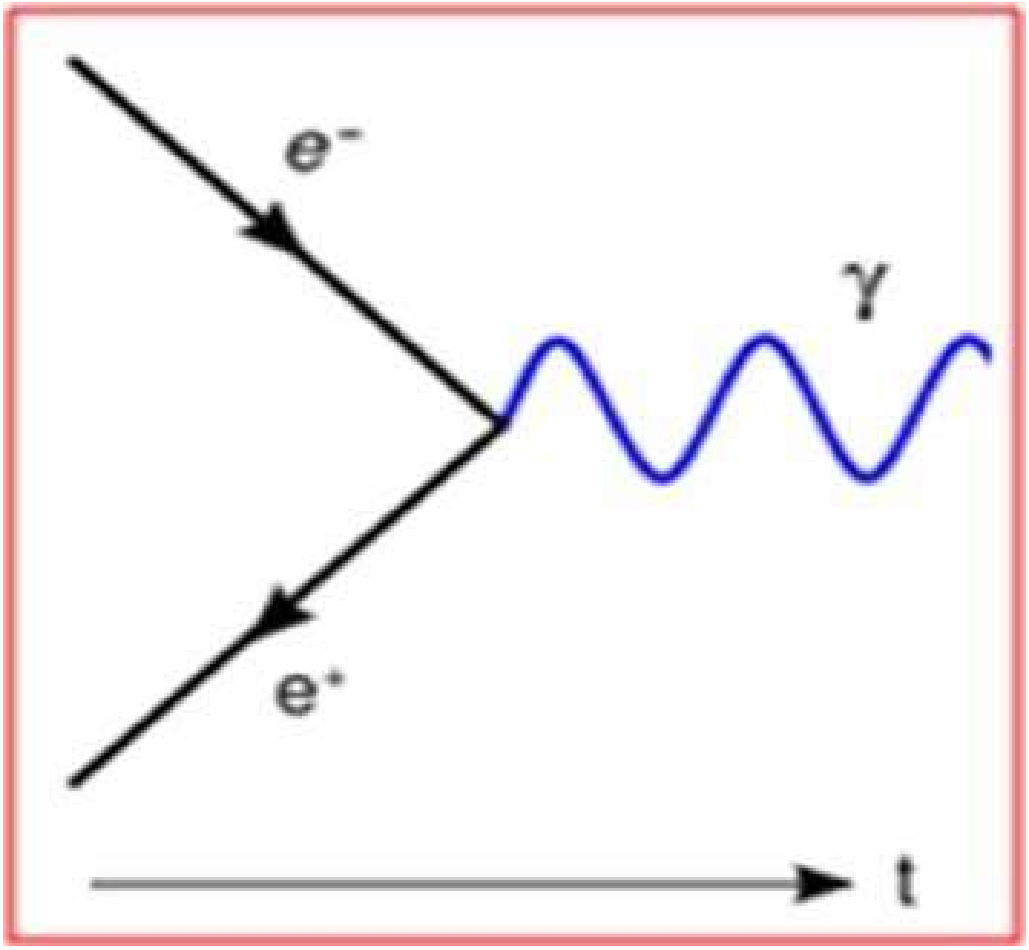
In the case of a single free particle (or a system of non-interacting particles), this does not lead to a serious difficulty, because we can restrict our attention to overlapping plane wave solutions of positive energy of Schrödinger's equation. However, this

[91] Penrose R (2005), *The road to reality: A Complete Guide to the Laws of the Universe*, Knopf Doubleday Publishing Group, 2005

is no longer the case when there are interactions; even for a single relativistic particle charge in an electromagnetic field, the wave function cannot, in general, maintain the positive time solution. This creates a conflict with the law of cause and effect as it introduces the possibility of retrocausality, of causes that retroact from the future.

Even though the official position is to reject retrocausality, a growing number of physicists is working on this possibility.

Richard Feynman's diagrams of electron-positron annihilation offer an example.



In the diagram arrows to the right represent electrons, arrows to the left represent positrons, wavy lines photons

According to these diagrams, electrons do not annihilate when they get in contact with positrons, but they release energy since they change their time direction becoming positrons and starting to move backward-in-time.

When Feynman diagrams are

interpreted, they necessarily imply the existence of retrocausality.

John Archibald Wheeler and Richard Feynman used the backward-in-time energy solution of the wave equation, the "*advanced waves*" solution, to solve Maxwell's equations.

Feynman has also used the concept of retrocausality to produce a model of positrons which reinterprets Dirac's hypothesis of the sea of negative energy occupying all possible states. In this model, electrons which move backward-in-time acquire positive charges.

In 1986 John Cramer, physicist at Washington State University, presented the Transactional Interpretation of quantum

mechanics.[92] The outcome of the experiments remains the same as those of the other quantum interpretations, but what characterizes this interpretation is the different perspective on what is happening, that many find easier and simpler. In this interpretation the formalism of quantum mechanics is the same, but the difference is how this formalism is interpreted.

Cramer was inspired by the absorber-emitter theory developed by Wheeler and Feynman which used the dual solution of Maxwell's equation. As it is well also known the generalization of Schrödinger's wave equation into a

[92] Cramer JG (1986), The Transactional Interpretation of Quantum Mechanics, Reviews of Modern Physics, 1986, 58: 647-688.

relativistic invariant equation (Klein-Gordon's equation) has two solutions, one positive, which describes waves which propagate forward in time, and one negative, which describes waves which propagate backward-in-time.

This dual solution allows to explain in a simple way the dual nature of matter (particles and waves), non-locality and all the other mysteries of quantum mechanics and permits to unite quantum mechanics with special relativity.

The transactional interpretation requires that waves can really travel backward-in-time. This assertion is counterintuitive, as we are accustomed to the fact that causes precede effects. It is important to

underline that the transactional interpretation considers special relativity, which describes time as a dimension of space, in a way which is totally different from our usual way of thinking.

The Copenhagen interpretation, instead, treats time in the classical Newtonian approach, and this leads to the use of consciousness in a mystical way.

The probabilistic equation developed by Max Born in 1926 contains an explicit reference to the nature of time and to the two possible solutions of the advanced and delayed waves. Since 1926, every time physicists have used Schrödinger's equation in order to calculate quantum probabilities,

they have considered the advanced waves solution without even realizing it.

Cramer's mathematics is the same of the Copenhagen interpretation. The difference lies solely in the interpretation. Cramer's interpretation solves all the mysteries of quantum physics, making it also compatible with the requirements of special relativity. This miracle is achieved, however, at the price that the quantum wave can actually travel back in time. At first glance, this is in sharp contrast with common logic, which tells us that causes must always precede effects, but the way in which the transactional interpretation considers time differs from common

logic, since the transactional interpretation explicitly includes the effects of the theory of relativity.

The Copenhagen interpretation, instead, treats time in the traditional Newtonian way, and this is the cause of the inconsistencies and paradoxes which are observed in the experiments.

Yoichiro Nambu (2008 Nobel Prize for physics) has applied Feynman's model to the processes of annihilation of particle-antiparticle couples, arriving at the conclusion that it is not a process of annihilation or creation of couples of particles and antiparticles, but simply a change of the time direction of particles, from

the past to the future or from the future to the past.[93]

In 1977 Costa de Beauregard used the concept of retrocausality to explain quantum entanglement.[94]

The idea that the arrow of time can be reversed is very recent. Until the XIX century, time was irreversible, a sequence of absolute moments. Only with the introduction of special relativity the concept of retrocausality started entering the scientific world.

In 1954 the philosopher Michael Dummett showed that there is no philosophical contradiction in the idea

[93] Nambu Y. (1950) The Use of the Proper Time in Quantum Electrodynamics, Progress in Theoretical Physics (5).

[94] De Beauregard C (1977), Time Symmetry and the Einstein Paradox, Il Nuovo Cimento, 1977, 42B.

that effects can precede causes.[95]

In 2006 AIP (American Institute of Physics, 2006) organized a conference in San Diego California titled "Frontiers of Time: Retrocausation – Experimental and Theory."[96]

In November 2010, President Barack Obama awarded the physicist Yakir Aharonov the National Medal of Science for the experimental studies which show that the present is a result of causes which flow from the past as well as from the future. These results suggest a radical reinterpretation of

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[95] Dummett M (1954), Can an Effect Precede its Cause, Proceedings of the Aristotelian Society, 1954, Supp. 28.

[96] American Institute of Physics (2006), Frontiers of Time. Retrocausation – Experimental and Theory, AIP Conference Proceedings, San Diego California, 20-22- June 2006.

time and causality.[97]

Einsteins' Special relativity started a new description of reality: on the one hand energy and matter that propagate from the past to the future, on the other energy and matter that propagate backward in time from the future to the past.

Einstein used the term Übercausalität (supercausality) to describe this new model of time that combines causality and retrocausality.

In the paper "*A novel interpretation of the Klein-Gordon equation,*" Wharton concludes that:

"*It is obvious that quantum mechanics is*

[97] Aharonov Y (2005), Quantum Paradoxes, Whiley-VCH, Berlin, 2005.

counter-intuitive, but it must be counter-intuitive for a reason – some human intuition that fundamentally contradicts some physical principle. One example of this would be the well-known conflict between our direct experience of time and the more symmetric treatment of time in fundamental physics. If the counter-intuitive aspects of quantum mechanics could be explained via classical fields symmetrically constrained by both past and future events, then it would be a mistake to reject such a solution based solely on our time-asymmetric intuitions."[98]

In the special issue "*Emergent Quantum Mechanics – David Bohm Centennial Perspectives*" published in

[98] Wharton KB (2009), A novel interpretation of the Klein-Gordon equation, Foundation of Physics, 2009, 40(3): 313-332.

Entropy, retrocausality is extensively reviewed with a total of 126 references.[99] This shows that the concept of retrocausality is finally entering the field of physics.

In the words of Richard Feynman, the wave/particle duality contains the "central mystery" of quantum mechanics:

"*The double slit experiment is a phenomenon which is impossible, absolutely impossible, to explain in any classical way, and which has in it the heart of quantum*

[99] Walleczek J, Grössing G, Pylkkänen P and Hiley B (2019) *Emergent Quantum Mechanics – David Bohm Centennial Perspectives*, www.mdpi.com/books/pdfview/book/1203

mechanics."[100]

Richard Feynman considered this experiment so important that he dedicated to it the first chapter of the third volume of his famous "*Lectures on Physics*."

Syntropy and the dual solution of the Klein-Gordon equation predict the duality wave/particle, as the manifestation of causality and retrocausality. Particles are the manifestation of causality, whereas waves are the manifestation of retrocausality (not yet determined and probabilistic).

The Klein-Gordon equation

[100] Feynman R.P., et al. (2006), The Feynman Lectures on Physics, Addison Wesley. 4-1.

describes reality as a continuous interplay between emitters and absorbers, causality and retrocausality, causes and attractors.

In the absence of one of these two, there would be no exchange of matter or energy.

If only causality exists, that is the emitting part, a battery would have a single electron-emitting pole. On the contrary, two poles are needed, one that emits and the other one that absorbs. In the absence of this duality, touching only the emitter (-) or the absorber pole (+), there is no flow of electricity.

In the quantum level, this continuous interplay between causality and

retrocausality (emitters / absorbers) causes matter to always manifest as waves and particles combined.

The duality waves/particles support the supercausal nature of reality with past and future constantly interacting.

EPILOGUE

Generally, we tend to overlook the invisible dimension as it is widely believed that it does not exist and that decisions should be based only on facts. This attitude has led people away from insights, inspirations and dreams and has limited decision making only to rational processes that increase entropy.

In the book The Voice of Truth" Gandhi states:

"There is an indefinable mysterious power that pervades everything. I feel it, although

I do not see it. This invisible force makes itself felt and yet challenges any demonstration, because it is so different from everything that I perceive with the senses." [101]

The supercausal hypothesis[102] posits the existence of a dimension vital to life, which is invisible to us, although we can feel it in subjective and qualitative ways. A knowledge which has been kept intentionally hidden since it allows to drain the vital energy of people and nations.

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[101] Gandhi MK (1968), *The Voice of Truth*, Nvajivan Trust, Ahmedabad.

[102] Di Corpo U and Vannini A (2014), *The balancing role of Entropy / Syntropy in Living and self-organizing systems: QUANTUM PARADIGM*, www.amazon.com/dp/B00KL4SP70

The satirical novella *Flatland*, written in 1884, well describes our present situation:[103]

"It is true that we have really in Flatland a Third unrecognized Dimension called 'height', just as it also is true that you have really in Spaceland a Fourth unrecognized Dimension, called by no name at present, but which I will call 'extra-height.' But we can no more take cognizance of our 'height' than you can of your 'extra-height.' (…) Well, that is my fate: and it is as natural for us Flatlanders to lock up a Square for preaching the Third Dimension, as it is for you Spacelanders to lock up a Cube for preaching the Fourth. Alas, how strong a family likeness runs through blind and

[103]Abbott EA (1884), *Flatland*, Seely & Co, UK.

persecuting humanity in all Dimensions! Points, Lines, Squares, Cubes, Extra-Cubes -- we are all liable to the same errors, alike the Slavers of our respective Dimensional prejudices."

Who ventures in the realm of Supercausality finds little support, but nevertheless the discovery of the invisible dimension of syntropy is worthwhile.