The heresy of Fantappié and Teilhard and the converging evolution

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Abstract

Even science has its dogmas. And it happens that scientists sometimes question these dogmas and run into the charge of heresy. This is what happened to Luigi Fantappié (1901-1956), the brilliant mathematician from Viterbo, Italy, who was well known for his theory on analytic functionals which extends the work of Volterra, Cauchy, Riemann and Weierstrass, and for the theory of the physical universes. But, I want to talk here about the theory of syntropy which goes well beyond mathematics and physics. On May 13, 2012, Professor Ulisse Di Corpo spoke about this theory at the Pontifical University of Sant'Anselmo in Rome. An appropriate place, since the theory of syntropy has important implications in the fields of biology, psychology, sociology, philosophy, and even theology.

From Einstein's special relativity to the concept of total existence

At just 21 years of age Luigi Fantappié graduated in pure mathematics with honours at the Scuola Normale of Pisa, the most exclusive Italian university. In 1950 he was invited by Robert Oppenheimer to join the Institute for Advanced Study at Princeton. The exclusive institute of which have been members Albert Einstein, Kurt Gödel and John von Neumann, to name but a few.

Fantappié was considered among the most famous mathematicians worldwide, but in 1942 he formulated the *Unitary Theory of the Physical and Biological World*, which he completed in 1947 with the concept of total existence.

Fantappiè starts from the consideration that half of the solutions of the fundamental equations of the universe had been rejected by physicists. While discussing about this topic with two colleagues, a biologist and a physicist, Fantappié came to the conclusions that the solutions which had been rejected are real since he could see its properties in living systems. Fantappiè's started from the d'Alembert operator, which combines special relativity with quantum mechanics, but in order to make this theory more immediate and intuitive, Di Corpo explained it starting from the energy/momentum/mass equation of special relativity:

$$E^2 = m^2c^4 + p^2c^2 \qquad (1)$$

In this equation E is energy, m mass, c the constant of the speed of light and p the momentum. This equation is quadratic and has two solutions, one positive (+E) and one negative (-E). Physicists had

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always rejected the negative solution since in the variable p there is time and in the negative solution time flows backward, from the future to the past. It is needless to say that most physics considered this solution absurd since it implies that effects can precede their causes. To break the deadlock Einstein proposed to put $p = 0$, since the speed of bodies, compared to the speed of light, is very low and can be neglected. In this way the energy/momentum/mass equation simplifies into the famous:

$$E = mc^2 \tag{2}$$

which is generally associated to Einstein. Since the (2) is no longer quadratic it admits only one solution, the positive solution (+E).

Diverging and converging energy

Problem solved? It seemed so for twenty years. But, in 1924 Wolfgang Pauli discovered that electrons revolve around their centre (spin) at very high speeds approximately that of light. The spin is an angular momentum, which cannot be set equal to zero. It follows that, when working in the field of subatomic physics, the extended formula of relativity (1) must be used, with its two solutions. The trick which Einstein devised could not be used in quantum mechanics to avoid the absurd backward in time solution. The first equations produced by the physicists Klein and Gordon in 1925 had the unacceptable backward in time solution and the scientific community decided to reject them, removing by authority special relativity from quantum mechanics, and eliminating in this way the unwanted negative solution. Fantappié could not agree with this decision. If the formulas contain a backward in time solution, how can we reject it and declare that it is meaningless? Fantappié believed that mathematics has a principle of reality, it means something real, and we cannot take in consideration only the part of the formulas that suits us. Consequently Fantappiè decided to study the properties of both solutions, the positive and the negative solution and he found that the first solution describes energy that diverges from a point, from a source, as for example the light emanated from a light bulb, whereas the negative solution describes energy that diverges from a point, backwards in time. But we move forward in time and we experience the negative solution as converging forces. Fantappié named this tendency syntropy (from Greek *syn*=converging, *tropos*=tendency), in order to distinguish it from the law of entropy which governs the positive solution.

Life originates from the future

Studying the properties of syntropy Fantappié found the mysterious qualities of living systems, namely the increase in organization, structure, order and complexity and arrived to the suggestive hypothesis that the origin of life needs to be searched in the future and not in the past. In other words, causality in life would not precede but be ahead. The academic world did not like the idea of introducing finalism in science and Fantappié was deeply religious. He repeatedly stated that the theory of syntropy had made him understand the basic mysteries of faith, the meaning of which appeared to him suddenly clear. Also the religious world did not like Fantappiè's conclusions which were considered a sin not easy to forgive. The convergence of faith and science was not accepted in the scientific and religious community. The following passage from a letter written by Fantappié to a friend describes the implications of his theory:

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

Mainstream physics is based on the dogma that causes must always precede effects. Fantappié was instead showing that causes can lie in the future and retroact on the present and that living systems would react to this backward causation. This was considered heresy both by the academic and religious world, and syntropy soon fell into oblivion, degraded into a philosophical idea of an eccentric mathematician, who had certainly been a genius, but, at some point of his career, had swerved dramatically. The echo of this negative attitude can be found in the sharp and hasty judgments which are found in the documents of the academic world. For example, the MATEpristem site of the Bocconi University write that: "*Luigi Fantappiè left a hundred works of which the most notable is a large memory on analytic functionals, based on an ingenious transportation of the basic formula of Cauchy in the calculation of functions of complex variables to the functional. In his last years he also worked on scientific/philosophical issues, but with questionable results.*"

The God of Iron of Teilhard de Chardin

This opinion is not shared by Professor Di Corpo and his wife Antonella Vannini, who have chosen to devote most of their studies and their energies to these questionable results. The PhD thesis of Antonella Vannini was based on the following hypothesis: "*if life draws its nourishment from syntropy, then the systems that support vital processes, such as the autonomic nervous system, must show pre stimuli activations. If this is true, the parameters of the autonomic nervous system, such as*

the heart rate and skin conductance, should react before stimuli." The experiments conducted by Vannini for her PhD thesis show that the heart rate reacts before the onset of stimuli. These pre-stimuli activations are strong and easy to replicate. It is worthwhile saying that heart rate values change significantly in advance to emotional stimuli and this suggests that syntropy is perceived in the form of emotions. We would perceive our future only at the emotional level.

Starting from this past-future duality another mathematician, the New Zealander Chris King, has developed a model of consciousness in which free will would arise from our being immersed in a dual stream of information travelling in opposite directions of time: on the one hand information from the past in the form of memories and experiences, on the other hand information from the future in the form of emotions. We must constantly choose between what our head reminds and tells us and what our heart points us to. The perfect balance of the negative and positive solutions would explain the symmetry between rational and emotional hemispheres.

From a cosmological point of view, the syntropy model states that there is a starting point, from which energy diverged and a final point towards which energy converges. The starting point is the big bang, whereas the end point is the big crunch. Teilhard named the big bang the Alfa point and the big crunch the Omega point. These two diverging and converging polarities work together, but in opposite time directions. In the big bang, energy explodes and diverges forward in time, but converging forces brings energy to condensate, to become matter, atoms, stars, galaxies, and lead the universe to increase its degree of complexity. Teilhard said that, as a child, one of the mysteries that fascinated him most was how matter could hold together. Speaking of a metal toy as a god of iron, Teilhard said: "*I just cannot understand how matter can stay together.*" In fact this is one of the most difficult problems of classical physics: converging forces, like gravity, are described and studied, but they are not explained. The theory of syntropy, on the contrary, provides an explanation of converging forces: matter is cohesive because of attractors that act from the future and lead energy and matter to converge. Somehow the future already exists. The Omega point towards which we are evolving is already here, but the paths to get there can be the most different. The dual solution of the fundamental equations endows us with free will and we constantly have to choose our path, and the evolution to the Omega point and syntropy is not linear.

Di Corpo goes further: if the theory of syntropy is correct, three levels of time must exist. The sequential time to which we are accustomed to, in which energy is divergent and entropy prevails, would be typical of expanding systems, such as our universe. On the contrary, in a converging system the flow of time would be reversed as it happens in black holes. There are also systems in which diverging and converging forces are balanced, such as atoms. At this level time is unitary and past, present and future coexist.

Water as a bridge between the micro and macro worlds.

In summary, the scenario described by the theory of syntropy is as follows: at the macrocosmic level the law of entropy dominates, leading to the dissolution of structures, systems and forms of organized complexity. Entropy tends to unravel, to move from complex to simple. At the atomic level, however, the law of syntropy is available and life would feed on this energy. But how does syntropy flow from the atomic level to the macro level? This question is answered by Di Corpo referring to Wolfgang Pauli who had discovered that the water molecule has a very special property. The hydrogen atoms is suspended between the microscopic and macroscopic level, forming a bridge, called the hydrogen bond, which allows syntropy to flow from one level to the other. For

this reason water behaves differently from all other liquids: when it freezes, for example, instead of becoming more dense and sink, it expands and floats. All the properties of water are symmetric to those of other liquids, since the law of syntropy prevails over the law of entropy. Since water allows syntropy to flow into the macro level it is vital to life.

The syntropy model strikingly coincides with that of Teilhard de Chardin: life, rather than being caused, would be guided by attractors which already exist in the future. Some biologists have made interesting studies in this regard. One is Rupert Sheldrake, who found that when mice are taught to solve a task, all the other mice of the same species learn to solve the same task quicker and better. Information, apparently, spreads among individuals on a level different from the physical one. Sheldrake explains these results by the fact that individuals of the same species are united by a common attractor which operates as a bridge, transferring information. Based on this idea we can assume that there is already in the future a man-attractor towards which we are converging and evolving. It would not be an evolution by trials and errors, as dictated by Darwin's theory. At the microevolution level (where information is reduced) Darwin's trials and errors mechanism would operate, but at the macroevolution level (where information is increased) syntropy would operate through the mechanism of attractors which retroact from the future. The formation of new complex structures would be driven by attractors that guide macroevolution processes towards complex structures that already exist in the future. According to the syntropy model emotions play a key role in the evolution towards advantageous new solutions.

The Omega point and the energy of love

Unfortunately in the West we look at emotions as something negative, to keep at bay, even to choke. But working on patients with decision-making deficit, the neurologist Antonio Damasio discovered that this patients have undamaged logical reasoning abilities, but impaired emotions. Patients with injuries in the frontal lobes or addicted to alcohol or drugs have an impaired perception of emotions which would be the cause of their decision-making deficits. The theory of syntropy states that problem solving is based on rationality and experience, whereas decision making orients and guides us towards final aims, attractors, thanks to intuitions.

Fantappiè identified the Omega point, the final attractor, with love. For example:

> "*Today we see printed in the great book of nature - that Galileo said, is written in mathematical characters - the same law of love that is found in the sacred texts of major religions.*"
>
> "*The law of life is not the law of hate, the law of force, or the law of mechanical causes; this is the law of non-life, the law of death, the law of entropy. The law which dominates life is the law of cooperation towards goals which are always higher, and this is true also for the lowest forms of life. In humans this law takes the form of love, since for humans living means loving, and it is important to note that these scientific results can have great consequences at all levels, particularly on the social level, which is now so confused.*"
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> "*The law of life is therefore the law of love and differentiation. It does not move towards levelling and conforming, but towards higher forms of differentiation. Each living*

> *being, whether modest or famous, has its mission, its finalities, which, in the general economy of the universe, are important, great and beautiful.*"

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

Similarly, Teilhard used to associate the Omega point with the energy of love.

Di Corpo explains the association between love and syntropy in the following way:

> "*Since syntropy leads energy to concentrate, a good connection to the attractor is felt in the autonomic nervous system (the are of the heart) in the form of feelings of heat and wellbeing. This experience is usually described as love. On the contrary if we are not oriented towards the attractor entropy prevails and we experience distress, feelings of cold and emptiness in the area of the heart. These opposite feelings of love and emptiness act like the needle of a compass with the function to guide us towards the attractor.*"

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

Entropy and syntropy, for their part, are complementary, since they stem from the same equation. Consequently, we cannot say, following a Manichaean view, that entropy is bad and syntropy is good. There is a constant interaction between these two polarities: we concentrate energy through syntropy, but beyond a certain point we cannot acquire any more energy and entropy releases it. This is well shown in metabolism which is divided into anabolism and catabolism, a phase of construction of structures and a phase of destruction, in short a constant process of doing and undoing.

Di Corpo has wisely avoided reaching simplistic conclusions like "the theory of syntropy demonstrates the existence of the Logos." Faith is the realm of personal choice, not of mathematical and scientific proofs. Fantappié and Teilhard de Chardin are among the many scientists who have investigated the relationship between science and mystical intuitions, faith and truth, paying a high price for their bold ideas.

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