

# Syntropy: the energy of life

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Luigi Fantappiè (1901-1956), one of the major Italian mathematicians, while working on quantum mechanics and special relativity, discovered that all physical and chemical phenomena, which are determined by causes placed in the past, are governed by the law of entropy, while all those phenomena which are attracted towards causes which are placed in the future (attractors), are governed by a law which is symmetrical to entropy and which Fantappiè named syntropy.

## 1. Symmetry of time

The energy-momentum equation  $e^2 = p^2 + m^2$  has dual energy solutions, one negative and one positive:

$$-e \leftarrow e^2 \Rightarrow +e.$$

According to special relativity, negative energy has reversed temporal behaviour in space-time, travelling from future to past. In order to show that this solution was non-existent Paul Dirac, in 1928, extended the energy-momentum equation to the study of electrons, discovering the electron's antiparticle formula, which flows from the future to the past. In 1932 Carl Anderson observed the existence of anti-electrons in cosmic rays, and named them "positrons"; later Feynman showed that all particles have anti-particles, arriving to what Enrico Fermi named the "sea of anti-matter".

The discovery of anti-particles leads to a concept of time where past, present and future co-exist; this discovery can be considered as important as the other great counter-intuitive discoveries of science:

- it was intuitive to imagine the Earth flat but counter-intuitive to imagine it round;
- it was intuitive to imagine the Sun orbiting the Earth, but counter-intuitive to imagine the Earth orbiting the Sun.

Now we observe a new counter-intuitive discovery:

- it is intuitive to imagine time flowing from the past to the future, but counter-intuitive to imagine the past, present and future which co-exist!

The solution which travels forward (past  $\Rightarrow$  future) is called *retarded potentials*, whereas the one which travels backwards (past  $\Leftarrow$  future) is called *advanced potentials*.

## 2. Syntropy

At the beginning of 1940 Luigi Fantappiè, working on quantum mechanics and special relativity, found that:

1. the solution of the retarded potentials, which describes waves diverging from a source located in the past, is governed by *entropy*;
2. the solution of the anticipated potentials, which describes waves converging towards a source located in the future (attractor), is governed by a principle symmetrical to entropy which Fantappiè named *syntropy*.

Entropic phenomena are governed by the second law of thermodynamics according to which a system tends towards homogeneity and disorder.

Syntropic phenomena invert the second law of thermodynamics and:

1. a reduction in entropy and an increase in differentiation is observed;
2. converging waves attract in smaller places energy and matter;
3. concentration of matter and energy cannot be indefinite and entropic processes are needed to compensate syntropic concentration;
4. in nature, syntropy and entropy interact constantly;
5. scientific finalism, final causes, are introduced;
6. a new scientific methodology is needed since the experimental method can only study causes located in the past;

These findings were presented on the 30<sup>th</sup> of October 1942 at the Accademia d'Italia, in the form of a volume titled "The Unified Theory of the Physical and Biological World" in which the properties of the syntropic phenomena were carefully described by Fantappiè.

### 3. Syntropy and life

Studying the qualities of syntropic phenomena (finality, differentiation, order and organization) Fantappiè concluded that syntropy is the essence of life: *"Let us conclude by looking at what we can say about life. 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 are final causes, syntropy. 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."*

It is the first time that the energy of life is deducted from physical laws (special relativity and quantum mechanics).