

THE LAWS OF PHYSICS AND THE PRINCIPLES OF ETHICS

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Since Giordano Bruno was burnt alive at Campo de' Fiori Square in Rome, and Galileo Galilei was forced to abjure, again in Rome, the Western world has distanced itself from the classical idea of *Science* as *Natural Philosophy*, from knowledge conceived as search for the laws that govern nature. Paradoxically, today's science – ever more at the service of war and subordinate to economic and political powers - is the result, in a certain sense, of two apparently opposite conceptions: on the one hand, a science conditioned by religion, ethics and the assumption that assigns science itself limited sovereignty to face questions of ethics and philosophy, and, on the other hand, a "scientificist", technocratic conception according to which science -and only science- is central.

Our aspiration is that such dualism be resolved within the context of a Science with the priority being on overcoming human beings' suffering and pain.

In this sense some recent high-level scientific studies (¹) within the framework of theories of *complex systems* allow us to address, from a single point of view, the genesis of both physical and ethical laws, a New Alliance (as Prigogine puts it). In synthesis Laughlin says the following: the so-called fundamental laws of Physics do not exist, but rather there are structural laws with an evolutionary direction, a Time arrow. Laughlin refers to a succession of different levels of organization of Matter, structures that are more and more complex and, at each level specific laws manifest themselves. It is not the laws that generate the structures, but rather the laws "emerge" from the structures as an expression of the dynamic stability achieved by structures themselves. This occurs, for instance, in thermodynamics and solid state physics.

This is the context within which we intend to give just a rough idea of the genesis of the laws in physics and in ethics. These laws are usually described through mathematical formulas, words, axioms, posits, definitions, commandments, dogmas, logical propositions, predicates. Conversely, we will attempt to adopt a different point of view that is based not on words, but rather on that which is *beneath* words and predicates; we will try to give a symbolical and allegorical focus to the question as from the image of *frontier*, of *wall*.

As we are not focused on words, we will not look for a definition of Science. We will not refer to consolidated truths, truths as rigid as walls. By Science we will simply mean an attitude open to dialogue, the *sharing* of experiences, observations, classifications, beliefs and models of the *world*.

Such an attitude is often labeled as *relativistic* since it implies *doubts*. On the contrary, for us this is a value, because, *if there are doubts, it means that there are beliefs*, but *if there are beliefs without doubts, it means that we are locked behind the wall the dogmatism*.

Let's imagine a wall...

The Chinese Wall, ... the Berlin Wall, ... the wall that separates Israel from Palestine, ... the wall between USA and Mexico.

These walls - just like any other wall - always represent a desire, the necessity or the demand to

¹ We refer to René Thom, mathematician (1923-2002), author of "*Structural Stability and Morphogenesis*", Ilya Prigogine (1917-2003), Nobel laureate in chemistry, author of "*La Nouvelle Alliance*", and Robert Laughlin (1950), Nobel laureate in physics, author of "*A different Universe*".

give stability to a structure, be it physical, metaphysical, theological, social, moral, ethical, political or religious. But, if doors are closed, if the protection is excessive, there is the risk of involution, of resistance to change. Morphogenesis is blocked: in a closed system, entropic death is the necessary outcome. In this way, it may well happen that -in physics, in society, in the psyche- walls arise, nuclei of beliefs, of dreams that pose resistance to change, to adaptation, to transformation, to movement, to evolution.

Let's imagine a plain circumference...

A circumference is an abstract frontier; in mathematics, in the Set Theory, it can represent the famous empty set because there is nothing inside. Nevertheless, it is actually the empty set that numbers, arithmetic, mathematics as a whole are progressively built from. There are those who say that mathematics is built from the void, from nothingness, but this is not correct: as a point of fact, the empty set is not that empty; it has a frontier, an inside and an outside. In mathematics the empty set is considered a primitive entity; but, the frontier as a symbol is always the result of a dynamic process, a structure, that has reached stability. Every frontier features an "inside" and an "outside", every frontier has a *concave*, warm and protective like a nest, like a womb, and a *convex*, an outside, the open, the unknown, the stranger: that is why it is both frightening and alluring at the same time.

Let's imagine the solar system...

In the Ptolemaic model, the Earth was at the centre and the Sun revolved around it, on the periphery. Conversely, in the Copernican model, the Sun is at the center and the Earth on the periphery. In general, in a revolution or in a catastrophe, what used to be central becomes peripheral and *vice versa*. However the pattern of concentric spheres remains unchanged: the frontier is still there with its *concave* and its *convex*. The second model entails the passage from a closed (*concave*) cosmos to an open (*convex*) universe. This represents a more general process, i.e., learning to live within the protective *concave* and, at the same time, starting the exploration of the *convex*, the unknown.

It is, therefore, fundamental to be aware of frontiers, to take notice of walls. And this holds for Ethics as well.

Let's imagine a beating heart...

It is hard to imagine a beating heart separated from the body, it is difficult to imagine it as not structured within a living body; a "heart out of the body" reminds us of an anatomical portion extracted from a cadaver. Nevertheless, biomedical engineering today manufactures prostheses and artificial organs that can be easily imagined out of the body for they are planned and built outside the body. The body as a frontier, as a limit, as a wall, has been de-structured: its *concave* and its *convex* must be relocated.

The question is even more complicated because, for example, the equipment for extracorporeal circulation (heart-lung machines) allows the surgeon to perform a heart transplantation, where a sick heart is removed and replaced with the healthy, beating heart of a ... corpse. For this reason, the countries where heart transplantations are performed have revised the legislation that fixes the boundary between life and death. Frontiers stir, change, never remain the same. Today we speak of brain death, but we still discuss where exactly to set this limit: the advancement of medicine determines and conditions the frontier between life and death.

The same happens with the topics of *in vitro* fertilization, genetic engineering, human clonation. The same happens with Bioethics as a whole. We can imagine thousands of walls arising every time there is a meeting about bioethics.

But... how is it that a frontier comes to be?

How is this stabilization and protection structure formed?

Whether we are in the realm of physics, chemistry, biology, technology, etc., we may always observe the creation and growth of a *net*, a series of entities that connect with one another: by gravitational or electromagnetic attraction, by sexual attraction, by empathy, by sympathy, because of the need to solve a common problem, whatever the reason, initially small nets form, and then "small worlds" that further connect with one another. From microcosms to macrocosms, nets connect, get stable, get stronger, form a structure, to finally set up a steady, robust *system of protection*: a frontier, a *concave*, a *convex*.

In the Complex Systems Theory, the occurrence of a *protection phenomenon* is technically and high-soundingly glossed *attractive fixed point of the renormalization group theorem*; it is surely much simpler to call it, as Laughlin proposes, a *protection system*. Only when this structure is dynamically stable, can it be described by means of rules, equations, laws which are deduced from experimentation and observations.

The same happens when humans interrelate, for instance to find the solution to a common problem, when it is necessary to overcome pain and suffering. Soon the human net takes the form of a human structure, and with it, customs will take shape, and rules and laws: frontiers with their respective *concaves* and *convexes*. This *system of protection*, in both Ethics and Physics, is dynamic. But also in psychology, for example, the *ego*, the *I*, is fundamental for the development of human personality for it provides identity and self-esteem, but there comes the moment when this protective barrier may prevent the person from adapting to the external environment, from opening up to the world, thus hindering growth and evolution.

At the beginning of this brief presentation, we evoked a certain notion of science that originates from the ancient classical world. It is well known that in the Renaissance, such a concept was rediscovered. In Rome, in the Vatican Museum there is a room decorated by Raphael; in this room there is one of his most famous paintings: "The School of Athens" ⁽²⁾. This monumental fresco portrays the most important philosophers, mathematicians, geographers, astronomers, historians and scientists of ancient Greece: Zeno of Elea, Epicurus, Empedocles, Pythagoras, Xenophanes, Diogenes, Euclid, Archimedes, Parmenides, Socrates, Heraclitus (bearing Michelangelo's features) and others. This fresco is about a historical moment in which men understood that, through dialogue, knowledge could be cultivated and shared universally, as is the case with philosophy, physics, politics, and ethics itself.

At the center of the fresco the two most emblematic thinkers, Plato (with Leonardo's features) and Aristotle, are conversing in the search of Truth. Plato holds his *Timaeus*, the book of cosmology, in one hand, and with the other he points up to the heavens, to the world beyond, to the convex. Instead, Aristotle carries the book of *Nicomachean Ethics*, while his right hand faces downwards, to the earth, to the concave.

They represent the New Alliance we were looking for: the human being is the quadrature of the circle, they are at the midpoint between the square of the Earth and the sphere of the cosmos, right upon the boundary line between concave and convex.

On the frontier - only there - is dialogue feasible, only there is it possible to connect, to reconcile.

² http://upload.wikimedia.org/wikipedia/commons/9/94/Sanzio_01.jpg