

## Zero and Non-Zero Sum Games: judgment of values

*Philosophy is a game with objectives and no rules. Mathematics is a game with rules and no objectives.*

*David Hilbert*

Everything is, by different ways, interdependent.

In this way, as it was indicated by the ancient Roman god *Janus*, even in the planetary scale we always deal with two faces of the human being – an enlightened and another one obscure – in the

same way we count with two fundamental laws of thermodynamics and with two fundamental principles of games: *zero* and *non zero sums*, because, as the genial philosopher Charles Sanders Peirce showed, any concrete existence is founded on the number *two*.

A tennis match, for example, is *zero sum* game – there will always be a loser and a winner. A love relationship or when we are among friends is, or should be, a *non zero sum game* – with no loser or winner.

Any *zero sum game* implicates *dissipation* and, paradoxically, *concentration* – a value that transits from one to other state. When two warriors fight each other in combat, for example, they *apparently* are equal in the beginning, but will *apparently* be different in the end.

The first fundamental law of thermodynamics is that of energy aggregation, the second is that of dissipation, or entropy. *Entropy* implicates







In conceptual terms, every organism is nothing more than *non-zero sum game* – even if, in other planes, in different scales, *zero sum games* will be there. Darwin’s *Theory of Natural Selection* is an example of how it happens.

So, there is no date of birth for the *non-zero sum game* principle.

Sometimes we have the stereotyped image that the *zero sum game* can be understood as the fight for survival in a forest, for example, and that *non-zero sum game* is excellently represented by what we call *civilization*. But if those figures, even ideally, are very appropriated, we cannot forget that in any process both types of game will be present.

When we think about uncontrollable designs of fate, we touch the *non-zero sum* principle in a complex of interdependent particles, but simultaneously the *zero sum* one while *action* in dissipation.

Any memory articulation is creative par excellence, because it inevitably is about combinatory and dissipative complexes – after all, *creativity* nothing more is than different mixed things not completely associated before.

Even if the establishment of *form*, through the principle of *creativity*, is directly related to the first law of thermodynamics and with *non-zero sum game*, its aspiration to the universal, to the absolute determination of a state of concentration, is the expression of the second law of thermodynamics, the *entropy*, and the *zero sum game*.

The idea of *entropy* as fatal destiny of the Universe—in a process where, gradually, all energies would become equal, eliminating any possibility of more dissipation – was originally formulated in 1852 by the English physicist William Thomson.

In the first years of the 21<sup>st</sup> century, great part of people still believed that the second law of

thermodynamics – according to which everything would inevitably walk to a generalized disorder, differentiation or *entropy* – had already designed the terrible end of the Universe: everything disposed in equal particles... everything dead.

But, Ludwig von Bertalanffy, father of the *General Theory of Systems* – and who would be one of the spiritual founders of *transdisciplinarity* if the expression had not been coined by Jean Piaget only in 1970 – would argue in his book *Problems of Life*, dated of 1952, that «spontaneous order... can appear» in systems through which energy flow. Similar argumentation was also made, seven years before, by Erwin Schrödinger in his classical *What is Life?*, published in 1945.

«What is the most characteristic aspect of life? When it is possible to say that a part of matter is alive?» – Schrödinger asked – «When it ‘does something’, when it moves, when it changes matter with the environment... It is when avoiding the quick fall in the inert state of ‘equilibrium’ that

an organism appears so enigmatic; because of this, in the beginning of the human thought it was defended the idea of some special non physical power or supernatural acting in the organism...». The answer, then, would happen through a single word: *metabolism*.

The term *metabolism* appears from the Greek *ballein* that means “to throw”. From this word the expression *ball* appeared, meaning *to dance*, to *throw* bodies in movement. From that we have the term *ballet*. When to the Greek *ballein* the particle *sum* is added – forming *sumballein* – it means *symbol*, which brings us the idea of *to throw together*, of *co-incidence*. And it is also from there that the word *diabolic* emerges, from *diaballein*, which means to *throw through*, to *throw* something in the middle of people, provoking confusion and conflict. Added to the particle *meta*, which means *change*, it produces *metaballein*, or *metabolism* that indicates the idea of to *throw change* or, in different words, to deal with *change in movement*.

Such idea of *movement in action* quickly unveiled the principle of *exchange* as its basic meaning – *exchange* of energy or, more precisely, the capture of order from the environment, extraction of differential elements from the complex universe that composes each thing: *metabolism*.

Because of this, smaller the diversity fewer possibilities will be to capture order, and greater the tendency to *entropy*.

Later, Ilya Prigogine would make Bertalanffy's and Schrödinger's arguments even clearer when he affirmed that «the generation of *entropy* always has two dialectic elements: an element that is creator of disorder, but also an element creator of order. And both of them are always linked each other».

That is, the expansion inside a scenario of distribution and dissipation also generates



to which nothing *can be* and simultaneously *not be*, we plunged into infinite discussions of *excluding* character, when we should have in mind that other non-excluding logics would also be possible – as the mathematician Stephanie Lupasco showed in a so brilliant way.

So, when we deal with those stereotypes – *zero sum games* identified as business concurrence and principles of *Natural Selection*; and *non-zero sum* games as symbiosis and civilization design par excellence – we must keep in mind that they are, in fact, profoundly relative concepts.

Even the Marxian principle of *plus-value* implicates the permanent interchange with the *Other*. If the question was a simple expropriation of value by the most powerful, the value itself could not exist.

Because of this, when Marx reveals *plus-value* as the clue for the comprehension of the process of capital accumulation, he immediately



subjects. The economist and Nobel Prize Thomas Schelling observed this phenomenon when he argued that in an ideal case of pure *zero sum game* simply it will be no communication.

Selfish spirit is an artificial trace, a phenomenon of language, like what also happens with its opposite, altruism, as it was so clearly showed by Marcel Mauss in his classical book *Essai Sur Le Don*. When we *disinterestedly* offer a gift to someone, we are establishing hidden laces of obligation and debt, even if not aware about that.

A fact that is present even in the largest and most complex economic systems, as the mathematician John Nash showed it.

Even in combats designed by *Natural Selection* there is *symbiosis* – essential life principle responsible for the appearance of the first alive beings, as so brilliantly was demonstrated by Lynn Margulis.

The genial scientist and thinker James Lovelock, responsible together with Lynn Margulis for the elaboration of the *Gaia Hypothesis* in 1970, said that «we have grown in number to the point where our presence is perceptible disabling the planet like a disease. As in human diseases there are four possible outcomes: destruction of the invading disease organisms; chronic infection; destruction of the host; or symbiosis – a lasting relationship of mutual benefit to the host and the invader».

In this way, we are always dealing with elements of differentiation, principles of order based on *aggregation* and *desegregation* – to what we commonly call *good* and *evil*.

The Latin etymological roots of the words *good* and *malefic* – that in all Romantic languages are very similar to *bon* and *mal* – are so surprising as elucidative.

The French world *bon*, *good*, has its

etymological root in the Indo European expression \**du* that meant “usefulness” and “efficiency”. It passed to the Greek *dunamai*, which means “power”, and to *dunamis*, which indicates the idea of *force* and that generated our word *dynamics*. Then, it was transformed into the archaic Latin *duenos*, later producing the word *buenos*, which means “good”, and that passed intact to the Spanish *bueno* or the French *bon*. From this root it also appears the word *beauty* – after a diminutive form of the Latin *bonus*.

The English word *good*, by its turn, launches its etymological root to the Indo European \**ghodh*, which indicated the idea of “to bring together”, to “unite”.

Both the English word *good* and the Romantic *bon* indicate, by different paths, the principle of *aggregation* – unveiling a straight connection to the idea of *beauty*.

On the other hand, the origin of the prefix

*mal*, as in the word *malefic*, is launched to the Indo European particle \**m* that indicated the ideas of *limit* and *measure*. From that root many other words appeared, like the Sanskrit *manu*, which means “who thinks” and “who measures”, but also *measure*, *matter*, *mortification*, *mortis* that is *death* in Latin, *miracle* and *magic*.

The Indo European particle \**m* also meant *creative energy*, indicating the impulse to establish concentrated relations of different ideas – and this is the reason why it was the generator of the words *measure* and *miracle*.

Such a strange and enigmatic etymological origin for the word *malefic*, revealing a strong connection between those various words appeared from the Indo European \**m*, alerts us to the fact that all creative act is a construction, and that any *construction* implicates, in some measure, a *deconstruction*.

Everything bundled in the idea of *good*

refers to the principle of *usefulness*, of *efficiency* – revealing the first quality of *aggregation*.

When we deal with the *evil*, the *mal* – beyond of any judgment of value – we find in the deepness of its roots the principle of *desegregation*.

To *measure* we are first obliged to *desegregate*, and the same happens with the comprehension of *matter*. *Mortis*, *miracle* or *magic* are all them moments of desegregation of a determined reality.

So, in that so distant Indo European seed of our prefix *mal*, that is *evil*, we also have the root of the expression *man* – because any thought, any knowledge, implicates *desegregation*. And as the genial Portuguese poet Fernando Pessoa said, «what in me feels, is thinking». Fact that enlightens an ancient Vedic lesson: only difference produces consciousness.

*How* we deal with these principles, *how* we

establish *form*, or in other words, *how* we reveal ourselves while *form*, are fundamentally esthetical questions – perception strategies.

Therefore, the ways about how we design our *sensorial palette*, how we design what we *are*, our *sensorial design*, is the clue of the principles of order that have determined the *human*, in his most complex metamorphosis along thousands of years.

Different factors are responsible for the metamorphosis of our *sensorial palette*. Because we all are interdependent, those factors are directly related to the tendency of specific sensorial intensifications and also to the scale.

Between 1990 and 2004 the world population knew an explosive demographic growth of around 21%, but the increase of energetic consumption was even higher, surpassing the 30%! The increase of our energetic consumption surpassed in large measure that of the demographic.



nature – but also a celebrated physicist.

Boas, who would be recognized as the father of the anthropology that characterized the 20<sup>th</sup> century, was responsible for the concept of *ethnocentrism* and, so, also for the idea according to which it is fundamental to study each culture after its own terms. «All human activities may assume forms that give them esthetic values», said Boas.

On the other hand, *evolutionist* anthropologists – like White – defended that Caucasian races were absolutely superior because of an unquestionable evolutionary process. To Boas – even if sometimes his texts reveal a racist trace, common to the epoch – culture surpassed a pure biological reality. An idea that would give body to the idea of intelligence as a kind of dynamic collective and virtual organism – idea crystallized only in the end of the 20<sup>th</sup> century.

Leslie White found a direct identification

with the *socialist realism's* universe and dedicated great part of life fighting against Boas' ideas.

Curiously, as if he would be a contradiction with his strong conviction on a sovereign evolutionary factor, which put races ones ahead the others, establishing a single framework for human development, White defended that energy consumption – independently from the race – was the signal, par excellence, of cultural complexity and diversity.

To White, «culture develops when the amount of energy harnessed by people *per capita* per year is increased, when the efficiency of technological means of putting this energy to work is increased», or when both cases happen.

The famous conflict between White's and Boas' ideas generated a curious effect – White would be considered politically aligned to the *left*, because for him «culture evolves as the productivity of human labor increases» and – simultaneously

– with the *right*, because according to his world conception, it would exist superior and inferior races. On the other side, Boas would be considered in inverted terms, paradoxically.

In both cases – or, at least, in the judgment about White and Boas – the conflict seems to happen because the presence of orders of value.

But, when we leave aside judgments of orders of value and we stop considering that a race can be superior or inferior, the idea of cultural complexity and diversity directly related to energy consumption and transformation, being the establishment of form, emerges as a very interesting concept.

Later, other partisan of the *evolutionism*, the anthropologist Robert Carneiro, who was pupil of Leslie White, worked to *quantify* – and to *qualify* – civilizational stages demonstrating that all societies with formal law codes inevitably happened in urban concentrations larger than two

thousand inhabitants – even if not all societies with two or more inhabitants obligatorily have formal law codes.

Paradoxically, Leslie White’s thesis, according to which cultural diversity and complexity are directly related to energetic consumption, can perfectly fit in Franz Boas’ principle of *ethnocentrism*. And Boas’ ideas, who believed that all societies have their richness, can be perfectly understood under the energetic consumption approach, not implying the need to classify people as better or worse, inferior or superior.

What changes is the *scale*, and with it the whole structure of relations.

Peripheral sectors of megacities are a clear example of how it happens – places with high human density, where there is less energetic consumption and a dramatic simplification of cultural diversity, evident even in the speech, in the reduction of quantity and diversity of phonemes



economy.

Even so, the asymmetry of energetic consumption in planetary terms is very impressive. According to 2004 data, United States and Canada have a per capita consumption of energy practically two times higher than that of Europe and twenty times of Africa's average.

But, we cannot forget that, in civilizational terms, energetic consumption – like memory – is not exclusively an immediate data, frozen in a determined moment, in a specific epoch. It is a phenomenon of accumulation and dissipation.

Energy consumption indicates the metabolism of matter transformation and transmission of ideas.

When we take energy consumption as the establishment of *form* and, therefore, of *memory*, everything is revealed as esthetics.

Treatment, accumulation and consumption of energy are, in last analysis, a question of *order*, a question with esthetical nature, about the *order of thought* – never being, however, about *judgments of value*.

Independently of the type of society we are dealing with, not evocating any kind of human psychic unity, the concept of *civilization* implicates, by its fundamental nature, the structuring of form, an energetic density. It is the same basic principle of organic formation: *symbiosis*.

Not for other reason the world *civilization* begins in the Latin *civis*, which indicated *city*.

From that essential idea it was born the celebrated text by Emanuel Kant – *Idea for a Universal History with a Cosmopolitan Purpose* – where he suggests that human history has a kind of *hidden natural plan*.

Then, Kant argued that as history unfolds we

will be able to notice that «how the human race eventually works its way upward to a situation in which all the germs implanted by Nature can be developed fully, and in which man’s destiny can be fulfilled here on Earth».

Wouldn’t be such *hidden natural plan* what we simply call *logic*, which was so brilliantly demonstrated by George Boole as to be the *form of thought*, still in the 19<sup>th</sup> century?

The increase of accumulation and the intensification of energy consumption do not obligatorily mean higher concentration of energy – concentration of energy is a data of form, a specific condition of differentiation, of nature of order. Energy can exist in large quantities but dispersed.

And the nature of order that designs human has suffered a continuous metamorphosis along thousands of years – as it is attested by the material culture, since the most remote times.

The transformation of the fabric of knowledge has been directly related to the logical structure of informational storage and interaction systems – that is, to what designs our *sensorial palettes*, to what projects a *sensorial design*.

A metabolic transformation that finds full expression in the two fundamental principles of thermodynamics and that leads us to a reflection with the words of the legendary American journalist Walter Cronkite when he said: «Unfortunately, security and liberty form a zero-sum equation. The inevitable trade-off: to increase security is to decrease liberty and vice versa».