



TIME ZERO  
e m a n u e l  
dimas de melo  
pimenta 2010

**TIME ZERO**

**emanuel dimas de melo pimenta**

2010

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TIME

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*to Doru Paul  
in memory of my father*

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This book is the result of my lecture on Time at the Romanian Cultural Institute in New York City, in October 2009.

My first text related to time was written in 1983 – *Brief History of Time Design*, until now only in Portuguese. Then in 2006, I wrote another text, simply titled *Time*.

*Time Zero* is dedicated to my dear friend, philosopher and poet, Doru Paul, who invited me to give the lecture in 2009.

It is also in memory of my father, Dimas de Melo Pimenta, who died in 1996. My father was an inventor, designer, historian and industrial. The fact he knew great success in business hid his cultural side.

Years ago, when I was performing a concert with Merce Cunningham, I think it was at the Théâtre de la Ville in Paris,

I always had lunch with Takehisa Kosugi, a great friend. We talked about many things and at one point, Kosugi asked about my father. I told him he was an inventor of *time machines*.

I said that naturally, without thinking. Kosugi laughed. – Your father made *time machines*?! – he said with some irony, laughing even more.

My father designed and invented clocks. But to him those clocks were true *time machines*. I was, throughout his entire life, perhaps the only person he talked about philosophy. He was a quiet and closed man. He spent much of his life quietly, often in the laboratory, studying and designing clocks. When he died, he left over two hundred patents.

Everything for him was time. He loved the figure of Galileo. We talked often and at length, just we both, on questions related to time.

When I was a boy, there were about one thousand clocks

in our home. Many of them worked. The house had a special sound with hundreds of small mechanisms sounding *tic-tac*. At midnight it always was an explosion of sounds. And I always knew the order of those sounds, which clocks a little early or late in relation to the others. My friends did not understand how I was able to sleep with those sounds. But for me, those sounds were a wonderful music. When the clocks were removed from home, the space seemed to lose life. A part of my soul became silent.

This little book is dedicated to the memory of my father.

**Emanuel Dimas de Melo Pimenta**  
**2010**

*When I do count the clock that tells the time,  
And see the brave day sunk in hideous night;  
When I behold the violet past prime,  
And sable curls, all silvered o'er with white;  
When lofty trees I see barren of leaves,  
Which erst from heat did canopy the herd,  
And summer's green all girded up in sheaves,  
Borne on the bier with white and bristly beard,  
Then of thy beauty do I question make,  
That thou among the wastes of time must go,  
Since sweets and beauties do themselves forsake  
And die as fast as they see others grow;  
And nothing 'gainst Time's scythe can make defence  
Save breed, to brave him when he takes thee hence.*

*Shakespeare, Sonnet XII*



## SEVEN

*Time is nature's way to keep everything from happening all at once*

*Graffiti at the Pecan Street Café, in Austin, Texas, annotated by John Archibald Wheeler*

It has become commonplace to say, especially after the Second World War, that the world was sinking deeper and deeper into a *technocratic* age.

*Technocracy* means the *mastery of technique* – not of *technology*. The mastery of *to do*. But, in general, the concept is not understood in this way.

Not only, few people ask themselves about what the relation between such intriguing possibility – of a world

dominated by techniques – and the question of time.

According to many, and very pessimistic ones, we would be living on a planet more and more driven by technicians, apparently distant from humans, from their real problems, bureaucrats isolated inside environments that have little or nothing to do with daily life, dealing with empty and abstract issues – and that, paradoxically, radically affect the lives of many people.

However, in some sense, this already was the Platonic ideal, when the ideal society in the *Republic* would be ruled by kings philosophers, scholars, specialists – that is, those who know and love the know – but, according to most critical spirits against Plato, they would also inevitably be distant from the people. They would inevitably be despotic spirits.

More than two thousand years later, in the late 1950s, a movement emerged in Brazil asking people to exchange “the new by the people” – what in Portuguese sounds “o novo pelo

povo” – which eventually removed many artists and thinkers from the processes of knowledge, as if becoming more ignorant they were doing something good for people.

The word *technique*, from where the term *technocracy* is born, comes from the Greek *techne*, which means *ability to do, skill*. Thus, the term *technique* indicates the idea of “how to do”, or *know how*.

The Platonic ideal practically disappeared after the fall of the Roman world with the end of control over the production of papyrus in Alexandria, and reappeared only gradually in the late Middle Ages, the Renaissance and more particularly since the Enlightenment.

It is a false question, because in last instance only tyrants and despots can command *without knowing*, without knowing “how to do”. They ignore the *modus operandi* and submit all through force.

It is true that there were so-called *enlightened despots* – but they have been a historical rarity.

Thus, in most cases when people criticize a government, classifying it pejoratively to be a *technocracy*, what they do is, in fact, nothing more than to criticize the incompetence of their leaders.

Such phenomenon of the emergence of specialized fields – of *technicians* – and the transformation of a people into a society called *technological*, has an original relation with the concept of *time*.

When we say that it is about a *technocratic age*, or a *technological society*, we are implying the principle of *to do*, and with it that of *action* and *perception*.

Every action requires a *medium* and the medium is the message. Every action is the essence of what we call *information*, which etymologically means “to form inside”. When we act, we

inevitably establish a *plan of information*.

Every action, as well as every perception, involves time, because both of them are dissipative process. Changing the structure of action, we change the concept of time.

About eight thousand years ago, the Sumerian word *ti* simultaneously meant *arrow* and *life*, relating directly life to time and especially to an asymmetric time, with dissipative nature.

The expression *arrow of time*, with which we are so used and that has a formidable resemblance with the ancient Sumerian word, was coined by the English astronomer Arthur Eddington in 1927, as to conceptualize the direction of time in a relativistic four-dimensional world.

In his book, *The Nature of the Physical World*, published in 1928 with the objective of popularizing that phrase, Arthur Eddington said: «Let us draw an arrow arbitrarily. If as we follow

the arrow we find more and more of the random element in the state of the world, then the arrow is pointing towards the future; if the random element decreases the arrow points towards the past. That is the only distinction known to physics. This follows at once if our fundamental contention is admitted that the introduction of randomness is the only thing which cannot be undone. I shall use the phrase 'time's arrow' to express this one-way property of time which has no analogue in space».

Eddington described what he believed to be the fundamental principle of all existence, of all life—a phenomenon he described as «vividly recognized by consciousness, and required by reason».

It is important to remind that, in Greek mythology, the *arrow* was par excellence an attribute of Eros, god born together with the Earth, together with life, a fundamental force of all existence.

Interestingly, the word *eternal* has its etymological roots in the Latin *aetas*, which originally meant *lifetime duration*.

What we know is our way of knowing – and this is about everything, that is, about all ideas.

Even when dealing with something scientific, we are dealing with ideas.

The form of thought is what we call *logic*. Changing the logical structure – the structure of our perception and our cognition – we change what we know. The logical structure is directly linked to action, to consciousness in all its senses. And that is nothing but *aesthetics*.

Interestingly, regardless of how we approach these ideas, *consciousness*, *life* and *time* share a common root: no life without a membrane, without some kind of division, is known. And it also happens with *thought* and with *time*.

To the principle of division, established by the number *two*, we add that of *autopoiesis*: according to which the system changes depending on the environment, without losing its identity. That is, the system continuously exchanges all kinds of information with the environment and constantly changes, but paradoxically it remains consistent to its own existence.

*Autopoiesis* is the essence of Heraclitus's river, especially when he said: «We both step and do not step in the same rivers. We are and are not».

In life no division is possible without *autopoiesis*.

The concept of *autopoiesis* was coined by the brilliant Chilean biologists Humberto Maturana and Francisco Varela in the 1970s.

*Autopoiesis* explains what the genial Henri Bergson showed with perplexity when he said: «The distinct outlines we attribute to an object, and that gives it its individuality, are



nothing more than a drawing of a certain kind of influence we can exert at a certain point of space...».

To be and not to be. The time that is *past, present and future*, but which, paradoxically, it is *now*.

*Time, consciousness and life*, like any *concrete existence*, are characterized by the numbers *two*, by the principle of *difference* – but also by the *identity*, because it only happens in diversity.

The word *time* comes from the Indo European root *\*t* or *\*d* that indicated the idea of *division, of difference, of movement between two points*, and also of *light*. From that ancient root the English word god appeared, through the fusion of the particle *go* indicating movement and *d* or *t* indicating the idea of *light*, resulting in the sense of *moving light*, like the movement of the stars. The word *star* has the same etymological origin.

In the Latin universe the word *deus* – meaning *god* – also

emerged from the Indo European *\*t* or *\*d*, indicating the idea of *shining* and of *daylight*, but also of *division*, as if such concept was about something beyond the *human*.

The significance of that particle was not confined to *light* and *movement*, but also implied *division* and *difference*, as if it was dealing with the definition of two points and the *movement*.

So, the etymological origin of the words *difference* and *division* pertains to that same Indo European domain, sharing their meaning with the ideas of *god* and of *time*.

Gods are never subjected to time.

Time is always something essentially mortal.

Richard Buckminster Fuller defined the concept of *infinity* as being just a consequence of subdivision of the *finite* – a definition that could be applied to time, with the projection

of the idea of *eternity*.

Thus, Emmanuel Levinas said that «eternity is, like the linear time, a modality of finite time».

The idea of *eternity* is only possible as result of the division of time. If we could not, somehow, to *divide* time, we would not have the concept of *eternity*.

But how could we really divide something intangible like *time*? It actually is a profound and very refined abstraction.

There is no time without some kind of fragmentation and repetition.

Only the difference produces consciousness – as it is said by the classic Vedic texts.

*Time, life, consciousness and action* based on the principle of *difference*, that is, on the idea of *order*.

Order is *differentiation*. Disorder is *dedifferentiation*. When we deal with order, we are simply dealing with principles of differentiation.

When we change the principles of order, we change the nature of the difference, that is, we transform the logical structure, changing the form of thought and, therefore, changing what we know.

Over thousands of years we have participated in an ongoing metamorphosis of our structure of thought and, in this way, also of our idea of time.

It is natural that even nowadays we can find in various places of the planet people living concepts of time like they were lived hundreds or thousands of years ago.

Those transformations are designed by the mutation of technical universes, by the metamorphosis of *to do* and,

although the term is not quite correct, by the so-called *technological revolutions*.

When discussing major historical periods, we can identify some interesting patterns.

We are dealing, of course, with the nature of concepts, the order of thought and so, again, with an aesthetic issue.

But considering that we are dealing with *principles of order*, we will conclude that nature – in its concrete existence – always operates by opposites. Thus, synchronous sensory complexes generate diachronic effects, and diachronic systems project synchronic effects.

Of our sensory complexes, vision is the most strongly characterized by synchrony through *systasis* – a concept that means *everything taken in a single shot*. In its turn, hearing has a diachronic design.

While hearing projects the idea of time as a sovereign entity, as an independent and unique phenomenon which ties all the other ones, generating the ideas of *fatality* and *destiny*, vision establishes a concept of time as something dependent on the movement of other bodies, a product of Nature, resultant of a network of unexpected events in a discontinuous process, constituting the universe of the *miracle* and of the *free will*.

If we walk from the Sumerian universe to the present day, over about eight thousand years, we clearly notice a fluctuation between these axes, like kinds of attractors, singularities, faces of a process of *autopoiesis*.

I would not call such process an *evolution* of the concept of time, but yes its *metamorphosis*.

To the Sumerian universe, the movement of the arrow and the meaning of life coincided in the word *ti*. Even in the prehistoric Indo European universe – which is supposed to be totally independent from the Sumerian and Semitic worlds –

the fact that the particle \**t* or \**d* signify *cutting, movement* and *light*, producing, among others, the words *god, star, division* and *difference*, indicates how vision was already an important sense for that culture.

The constitution of the logical universe doesn't mean that it is totally dominated by this or that sensory faculty, but it indicates the form and the intensity of its use – the sensorial palette *design*.

Often, the magical metamorphosis of the concept of time emerges before us through other factors such as the design of the space, the graphical representation, the structure of myths and so on.

Essentially, what always meant the separation – division – between gods and humans was the time. Not all gods are super powerful, but to be gods, they must be immortal, may not belong to time.

And time, to exist, must be connected to the physical world. There is no time in metaphysics – though, curiously, it is often taken as the discipline par excellence of metaphysics.

To Wolfgang Achtner, Stefan Kunz and Thomas Walter the articulation between exogenous factors of time, like the cyclical movement of the Sun, for example, and the endogenous ones, belonging to our bodies, would form the basis of our consciousness of time, and would also be the root of *historical thought*.

But if so, animals in general would also have a *historical thought* and a concept of *time* – because the struggle for survival is marked by the conjunction of those two factors of time.

What projects a concept of *time* or a *historical thought* is language – verbal or nonverbal.

Language, taken in its broadest sense, is a virtual system of relations, a kind of organism that draws on the structure of



those relations the roots of concepts, the origin and essence of the ideas.

The earliest known origin of the word *language* is the Indo European particle *\*l*, which has emerged as a phonetic variant of *\*r* that, in its turn, indicated the idea of “going forward”.

When it was transformed into *\*l* it started having the meaning of *putting things together in order to retain or to release*.

In the *Rig Veda* we find, for the first time, the Sanskrit word *laksa* that means “to unite and to link in all directions”. *Laksa* also indicated the idea of *signal*, used to mark cattle. It certainly was a good thing because *Laksmi* is the name of the goddess of fortune and beauty, Vishnu’s wife.

This is the origin of what we call *language*: what joins things, to retain and to release.

Only with *language* we can construct the idea of time.

Some philosophers, like George Lakoff and Mark Johnson, believe that the origin of the concept of time is based on a process of *metaphors* related to the movement and, especially, to the body movement.

In his book *The Meaning of the Body*, Johnson argued that «we (adults) conceptualize time via deep, systematic *spatial-movement* metaphors in which the passage of time is understood as relative motion in space».

If it were like that, any conceptualization would originally be metaphorical. But metaphor is a degenerate process of sign relation, belonging to the realm of verbal language and result of the illusion of contiguity.

Johnson and Lakoff conclude that such metaphorical process would be universal automatically projecting, for example, the idea of *future* and *past* as being *front* and *back*,

taking the human body as a reference of the present.

But this is not a universal thing. It did not happen in the ancient Hebrew universe. As Hans Joachim Koellreutter stated, «in Hindi the word *kal* means both yesterday and tomorrow, its meaning depends on the context».

The Anthropologist Edmund Carpenter showed how the indigenous of the Trobriand Islands, in New Guinea, considered everything as *an eternal present*, recognizing only the *now*.

In Thai language the verbs do not have past or future, everything happens only in the present. The relative location in the past or in the future will depend on the context or on other indicators.

Our concepts are elaborated through processes of induction and deduction, not through metaphors!

Even not being metaphorical in nature, the idea of time

was, since the beginning, related to the observation of concrete events and the construction of memory – elements of aesthetic nature par excellence.

It is from the order of our senses that the order of our concepts emerges.

In this way, the idea of *time* would be directly associated to the discovery of death and, therefore, to the beginning of language.

It is intriguing and seductive to observe that the oldest known graves would be dated of about one hundred and thirty thousand years, like those of Skhul, in south of Haifa, and the controversial case of the Talbun cave, in the northern of that same city, in Israel.

Although evidence related to fossil and genetic analysis indicate that modern humans arose originally in Africa about two hundred thousand years ago, those tombs in Israel suggest

the possibility of having been created about at the same time the FOXP2 appeared, the gene associated to speech, which also appeared about one hundred and thirty thousand years ago.

This leads us also to questions about the beginning of language, not only verbal, and about the possibility of such a beginning have happened in a distributed way through different evolutionary stages, forming species of *punctuated equilibria*.

Rémy Lestienne, physicist and neuroscientist, director of the CNRS, also alerts to the fact that «biologically, the extraordinary development of the human frontal lobe during the last million years represents the evolution of our ability to anticipate the future, to take ever more distant our gaze. (...) Memory is needed to anticipate future, but it is not enough: animals have a good level of memory, but only mediocre results in the exercises in long-term anticipation. (...) Here we must address the problem of the difference between the appearance of the organ and the appearance of the function: if the development of the cerebral cortex dates back nearly a

million years, the ability of self projection in a distant future dates, according to all appearances, only about ten thousand years».

That is, curiously Lestienne points to the exact moment when the first writing appears.

Another indicator is the fact that any language – be it verbal or nonverbal – implies change, because there is no consciousness without difference.

Changes are logical elements that structure our sensation of time. The exponential growth – through the expansion of memory resources – of our ability of observation over thousands of years would have physically changed the sense of time. In this way, the design of such changes, the *order of consciousness*, or simply logic, transformed the concept of time.

The sensation of the “size” of time is directly related to the “quantity” of consciousness. What we call *consciousness* is not

a continuous thing. When we are alone, waiting for something, we are more alert – contrarily to what is generally believed – and time seems to run more slowly. When we dive in a book, in a good movie, or even when we are involved in a good chat, we are absorbed by the environment and time seems to run faster, because we are less conscious.

Such design of consciousness depends on the design of our *sensorial palette*, of how we operate our senses, intensifying some and diminishing others.

Logic deals exactly with that – the order of thought.

On the other hand, beyond sensation, the concept of time – which is related to it, and that depends on the design of our *sensorial palette* – only happens while past because the present – when we realize it – is already past. Even the future is, in a certain sense, always past – a kind of *open past*. Thus, the existence of time is always and inevitably supported by memory.

But, unlike what is generally believed, memory is permanent transformation. There is no stable memory. Every memory is continuous reconstruction, creativity and pure instability.

As the always genial Henri Bergson said: «The universe lasts. More we delve into the nature of time, more we realize that duration means invention, creation of forms, continuous elaboration of the absolutely new».

Amplifying the idea of the invention as a fundamental basis of duration, Ken A. Paller, director of the *Cognitive Neuroscience Program* at the Northwestern University of Illinois, United States, conducted a study in 1990 showing how easily we remember or forget things depending on our wills.

In this way, and in last instance, memory, future and past are, in fact, eternal present.



Many people have the illusion that time, in terms of perception, is something standard. That is, not only we all perceive it as a relatively uniform experience, as our own temporal experience is stable.

It is exactly the opposite. Not just taking the issue while information – which implies all media and sensory prostheses we use – our entire perceptual universe, bundled into neuronal complexes, is a profound diversity in terms of time perception.

The information happened on a finger arrives to its neural centers in the brain with a big time difference in relation to visual information, for example.

Our ears and eyes perceive a same physical phenomenon with strong differences of time – which is quite evident when we observe lightning during a storm and only after a few long moments we hear its sound.

If that is notable with great distances, it is apparently

irrelevant when we are close to those events. Such irrelevance is not a physical fact, but a cognitive strategy.

We retard and retain information, at the neural level, in order to give coherence to the whole.

In 1985 the German neuroscientist Ernst Poppel conducted researches demonstrating that our brains keep in short-term memory events for periods of about three seconds. That would be the average time of our consciousness. Events with less than three seconds tend to pass unnoticed.

Curiously, in that same epoch, during the International Meetings of the Locarno Video Art Festival, at Monte Verita in Ascona, Switzerland, I talked exactly about it with René Berger and another dear friend, the poet and electronic Italian artist Gianni Toti. Gianni said that I should pay attention and do not make in my works on visual art, any scene with less than three seconds – because, he explained, our brains cannot apprehended any thing in a shorter time period than that.

Gianni Toti did not know Poppel's work, but he had a great experience in audiovisual systems.

Beyond this, there are differences from person to person that multiply themselves exponentially. We constitute a universe of immense temporal complexity.

The speed of information flow inside our medullas varies between thirty to two hundred sixty feet per second. An information that happened in the soles of our feet will take ten to one hundred milliseconds to arrive at our heads. But if the stimulus had happened in the toes, such information will arrive twice as fast.

If the sensory event happens on the tongue, the information will reach the brain ten times faster. That is, the information doesn't arrive faster just depending on its geographic location, but also on its function.

In his book *The Brain's Sense of Movement*, published in

2000, Alain Berthoz showed how this phenomenon occurs and how neural strategy compensate those differences: «Another problem the brain has had to resolve to enable the fusion of multisensory information is that of time shift. Different lengths of time are actually needed for sensory signals to reach the coliculus. For example, a sound introduced to the ear takes around thirteen milliseconds to get there; a touch around twenty-five milliseconds; a visual stimulus around forty to one hundred fifty milliseconds, according to the alertness of the animal. But it gets even more complicated. If a bird sings in a tree fifty meters away from a cat, the sound transmitted through the air at three hundred thirty kilometers per second will take about a tenth of a second to arrive at the coliculus of the feline, whereas light, which moves at three hundred thousand kilometers per second, will arrive at the retina almost instantaneously. The solution adopted by the nervous system is one called ‘temporal windows’. It is extremely simple and extremely flexible. Electrophysiological recordings show that a light stimulus induces a discharge that can be maintained for mere than one hundred milliseconds; if a sound arrives

after several hundred milliseconds, the amplification of the response can still occur. The neuronal network of the coliculus thus develops a memory that maintains the sensitivity of the multimodal neurons during a certain time, hence the name temporal windows».

In 1970s, Benjamin Libet, physiology researcher at California University – a major scholar on consciousness – has found that not only we have different paths of information through our bodies, implying different times, as our neural sectors also have different timings to consolidate a set of information.

His most famous experiment demonstrated the discovery of two other investigators, Lüder Deecke and Hans Helmut Kornhuber, made in 1964, which was called *bereitschaftpotential* or *reading potential*. According to this discovery, electrical unconscious processes precede conscious decisions triggering acts that are experienced as volitional and spontaneous.

This time that determine our decisions – and which we feel like our freedom to act, our free will – also puts in cause the idea we have about time as a phenomenon.

Thus, result of action, time is designed by *function* – in its broadest sense.

Again according to Alain Berthoz: «Sensory inputs do not cover the same range of velocities. The vestibular receptors are fast and detect accelerations; vision is slower. The receptors of the muscular spindles have widely varying response times, which is also true for tactile receptors, whose bandwidths are different from those of vision, whereas very tight perceptual relationships exist between sight and touch».

Still in the nineteenth century, the Russian neurologist Sergei Korsakov, who lived between 1853 and 1900, described patients who apparently lost sets of memory specifically related to certain sectors of time. In the 1950s, these losses passed to be experimentally linked to specific brain areas.

Later it was discovered that there are two large fields of memory – short and long term. When a person loses the ability to sediment short-term memories into long-term memories, he has a pathology known as Korsakov's Syndrome.

The film *Memento* by Christopher Nolan, with Guy Pearce, made in 2000, shows how such impairment happens and, in a very interesting ways, how the sense of time is affected, or even designed.

Without sedimentation of short-term memory into long-term memory there simply is no time.

Interestingly, all means of accumulation of information – ranging from a tablet of clay, the papyrus, or paper to the most sophisticated systems of digital clouds – they are all prostheses of our long-term memories.

Thus, over thousands of years we were redesigning

our sense of time, not only in logical terms – where verbal or nonverbal systems are evident references, changing principles of order – but also in terms of amplification of our long-term memories.

Ultimately, both processes are inextricably linked.

However, when we let the scale of long-term memory and start to be focused on the processes of short-term memory, some interesting factors appear, truly revealing.

The neurologist Israel Rosenfield in his book *The Strange, Familiar and Forgotten*, published in 1992, gives us a very interesting approach about the achievement of the sense of time: «How do we measure the passage of time? Past time becomes truly specific only in relation to the immediate present; and time in the immediate sense is measured by our physical relation to our surroundings – the movements of our body».

Then, what we call *time* fundamentally happens as a



reference to the movements of our bodies.

Usually, people think that the notion and the sense of time arise from visual observation of changes. But if it would be like that, blind people would be out of time.

Even the genial Hellen Keller – deaf and dumb – lived the reality of time. But, as Rosenfield explains, «The blind, having no sense of the distance of physical goals, become aware of events after, not as, they happen; the world of immediate is lost, and the world of the future is difficult to judge. Dependence on bodily movements becomes monotonous, and the blind have the feeling that time hardly passes» – the phenomenon became known as *time-inflation*.

In this way, vision and hearing amplify and make dynamic the sense of time.

Time is thus a projection of all our senses – not only sight and hearing – in all its deepest complexity.

Also here – through countless sensory extensions and prostheses, like the automobile or the telephone, just to cite two examples – we redesigned our sense of time.

Freud said that living beings can be divided into two major groups in behavioral terms: the *autoplastic* and *alloplastic*. The first would change themselves to survive, while the latter would modify their environment with the same objective.

The human being is so deeply *alloplastic* that by changing everything surrounding him, he produced an intense *autoplastic* process, causing a metamorphosis even in the sense of time.

Not only the events that surround us are made up of *different times*, but also our bodies are a complex combination of different natures of time for the same sets of perception.

We can have common references, such as the movement of stars or systems of language, but the sense of time is different

for each person, something deep within each one of us.

Our neuronal systems anticipate movements in the most remote areas and slow movements in closer areas, as to constitute a homogeneous whole, producing the illusion of a uniform time – but of a personal uniformity.

This is called *endogenous time*, which is always in conjunction with the exterior time, like the cyclical movement of the Universe, which we call *exogenous time*.

One of the neuronal systems that establish a link between endogenous and exogenous time is the suprachiasmatic nucleus. It is a small region of the brain, located on the optic chiasm, where the optic nerves partially cross. The suprachiasmatic nucleus is responsible for the control of our circadian rhythms and is directly related to vision.

Changes in light affect not only our photoreceptor cells, but also the production of a hormone known as melatonin in

the pineal gland. It is believed that melatonin is responsible for the duration and quality of sleep.

What we feel as *time* is, in fact, an artifice of our bodies and the articulation between the exogenous and the endogenous times.

This relation – or what we commonly call *consciousness* – seems to be fundamental for the existence of our sense of *time*. When we are dreaming, or even in serious cases of schizophrenia and severe depression, the sense of time is virtually nonexistent.

Our bodies are fundamental in this relation. In his *Transcendental Aesthetics*, in the *Critique of Pure Reason*, Kant describes time as being «nothing more than the form of our inner sense, that is, the vision of ourselves and of our inner condition. Because time cannot be determined by outward appearances». It was written in an epoch of strong intensification of the use of vision and the phonetic alphabet, projecting the individual

as an element of essential importance. Still, even disregarding the factor of exogenous time, Kant's statement reveals much of what would be experimentally demonstrated centuries later, in neural terms.

Our neuronal systems have specific frequencies, which are a direct reference to our construction of time.

The limbic system, for example, known as the center of our emotions, also responsible for the activation of our consciousness and therefore strongly related to the notion of time, is deemed to have a base frequency of five to seven cycles per second.

The hippocampus is part of the limbic system, responsible for setting short-term into long-term memory. When the hippocampus is destroyed in both hemispheres, there is no fixing of memory.

The frequency of cycles of the hippocampus is not

constant, nor is the neocortical system, but unlike the latter, the hippocampus has a kind of flow pattern often fluctuating around forty cycles per second.

This flow pattern – as if it would be an orbit of a specialized mathematical strange attractor – responsible long-term memory setting, start to be stabilized in humans only between eight and ten years of age – when the notion of time is formed!

The great Jean Piaget, in his classic *The Development of the Concept of Time in the Child* of 1946, said that «the most elementary form of time is the sensory-motor temporal organization, from birth until the appearance of language. When crying with hunger, the baby calls for his food, with varying degrees of success, he is aware of certain durations, such as the wait, and when, looking to reach an object away, he uses in advance an appropriated intermediary – a stick, for example – he, thus, provides an order of succession between means and end. (...) But these practical durations and succession do not show at all the existence of a homogeneous time».

Up to four years old, or so, future becomes present, «*tomorrow* becomes *today* – and the present becomes the past – *today* turns into *yesterday*». But it is still a fragmentary notion of *before and after* and not a homogeneous body of succession that draws the world, much less a line of development of *past, present and future*, which requires a principle of reversibility at the logical level.

Initially, the child thinks «the physical time as if would be about inner durations, with the possibility to contract or dilate depending on the contents of the action», without the child reaches the idea of «a homogeneous time, common to all phenomena...».

An ability of operation that enables a view of time as the unfolding of a line of events, with homogeneous standards, in which a present moves itself on abstract conditions of past and future, is only consolidated in the child at around eight to ten years of age.

We must question whether this capacity, revealed after a certain age of the human being, wouldn't also be a kind of cultural instrument, typical of a certain structuring process of our sensory palette.

What would have been Kaspar Hauser's notion of time – who was a child raised by his mother like an animal, without verbal contact, in the town of Ansbach, Germany, and that was one of the most famous cases of police in the early nineteenth century?

The boy was abandoned when he was about fifteen years of age at a square in Nuremberg.

Later, Kaspar Hauser learned to speak, but he was never able to distinguish between dream and reality when referring to the long time he lived in a cage.

He ended up being mysteriously murdered. In 1973 the



film director Werner Herzog made a movie about that story, *Jeder für sich und Gott gegen alle*, which would become a classic.

In the 1970s, Bruce Powers and Marshall McLuhan started arguing that the intensive use of the phonetic alphabet, through papyrus and later through paper, generated an intensification of the activities of the left brain hemisphere, which is responsible not only for the right side of our bodies as well as for a sequential and causal logical structure: «The left hemisphere places information structurally in visual space, where things are connected sequentially – having separate centers with fixed boundaries. On the other hand, acoustic space structure, the function of the right brain in which processes are related simultaneously, has centers everywhere with boundaries nowhere. The former is like a painting or a photograph in perspective. The latter may be likened to a symphonic surround».

Later studies, especially with the use of PET scans,

demonstrated that the division between our hemispheres is not so radical and precise. When one of the hemispheres is affected, the other can, sometimes partially, substitute lost functions. Even in normal brains, the hemispheres *contaminate* themselves. Even so, the thesis of Powers and McLuhan continues valid.

Very curiously, generally we do not think that we live part of our lives – our childhood – in a certain sense outside of time; or even that people with senses of time completely different of ours could exist.

On the other hand, as claimed by Achtner, Kunz and Walter, we could dive into a «older, distant consciousness, so to speak, to *subtemporal* regions of the brain. Then, the mystic experience of time would be a regression of consciousness».

I'm not sure that the term *regression* is the most appropriated for this case. But the reflection of Achtner, Kunz and Walter reminds me Aldous Huxley's *The Doors of Perception*.

When he described his experiences with mescaline, he told that «the really important facts were that spatial relationships had ceased to matter very much and that my mind was perceiving the world in terms of other than spatial categories. (...) I saw the books, but was not at all concerned with their positions in space. What I noticed, what impressed itself upon my mind was the fact that all of them glowed with living light and that in some the glory was more manifest than in others. (...) Not, of course, that the category of space had been abolished. When I got up and walked about, I could do so quite normally, without misjudging the whereabouts of objects. Space was still there; but it had lost its predominance. (...) And along with indifference to space there went an even more complete indifference to time. 'There seems to be plenty of it', was all I would answer, when the investigator asked me to say what I felt about time. Plenty of it, but exactly how much was entirely irrelevant. I could, of course, have looked at my watch; but my watch, I knew, was in another universe».

Dealing with our bodies, with our sensory perception,

simultaneously with the uniformity and relative systemic stability, we are faced with a discontinuous and unstable framework in continuous metamorphosis.

Fundamentally, like what happens with the concept of space, the idea of time transits between two antagonistic poles – reminding the positions of Heraclitus and Parmenides about two thousand and five hundred years ago: the reality in permanent metamorphosis or the static universe for which all change is but simple illusion.

This fact is especially curious when we bear in mind that all concrete existence is designed by such a conflict: open, closed; light, dark; big, small, and so on.

Would we be simply transiting between the two essential conditions of existence? Are the two faces of time just *everything* and *now*?

Like what happens with space, time has also been

regarded as absolute or relative along thousands of years - even though, unlikely of what happens with space events do not coexist in time, they are not simultaneous.

Even if we can hear two musical notes forming a chord “at the same time”, they form – both of them – a single event and, for that reason, we call it *harmony*.

But... are space and time absolute or relative? That is, would they be determined by the distance between things or would have a concrete and independent existence, being a kind of container of all the rest?

Over hundreds of years, science – which since its birth has been established under the principle of the *measure* – was founded on the concept according to which the laws of Nature are invariant in time and space. A law of Nature can work differently depending on its environment, but it will be always valid in any position in space, over time, for similar spatial conditions.

When we wonder whether such a universal approach to time would be closer of Parmenides' thought, we must also ask whether this symmetry between space and time would be nothing more than an expression of the essential condition for the concrete existence of all things, everything based on the number *two*.

According to the texts available to us, Parmenides – who was a pupil of Xenophon – considered time as formed by a succession of fixed moments, in way to constitute a reality founded on the concept of immobility. That is, all laws would be valid in all times, because reality would be grounded on a kind of *eternal present*, or – as it would be called already in the twentieth century – some kind of *presentism*.

Interestingly, it is thought that Parmenides has been responsible for introducing the concept of *eternity*.

Eternity is only possible as consequence of the subdivision

of time.

According to the medievalists Eleonore Stump and Norman Kretzmann, «the earliest indisputable appearance of the concept of eternity is in Plato's *Timaeus*. Parmenides' description of the mode of existence of Being, or the One, in his *Way of Truth* is much older, but scholars disagree over whether Parmenides intended to ascribe atemporality to Being. Whatever Parmenides meant, what Plato says about eternity is in several respects just what Parmenides says about Being's mode of existence, and to that extent at least Parmenides may be thought of as the inventor or discoverer of the concept of eternity».

To Parmenides, the laws of Nature – what is known as *Truth* by the mystical world – are timeless questions.

That would be the same fundamental principle shared by Pythagoras' thought – about forty years older than Parmenides – to whom the entire Cosmos is dictated by the *number*. But

the *number* – even in its condition of quality – already pertains to a continuous line of succession, like the idea of time as *past, present and future*, and its laws are universal.

Even taking those fundamental principles of science to immemorial epochs, it would be only in 1918 that the great German mathematician Emmy Noether established a revealing postulate about the roots of scientific thought: the *law of conservation*. That is, every law of Nature obeys the principle of symmetry. No matter when an experiment is performed, the result will always be valid – until it can be refuted by another result equally valid in temporal terms, because the principle of refutability is not applicable neither to time nor to space, but only to environmental conditions.

The same happens with the idea of energy according to the first law of thermodynamics – in *Nature nothing is lost, nothing is created, everything is transformed*, as defended Mikhail Lomonosov in 1760 and, after him, Antoine Lavoisier, in the establishment of the *Mass Conservation Law*.



Nothing is lost, nothing is created, everything is transformed, no matter where or when.

And according to the principles of thermodynamics the *energy of the Universe is constant*, as it is defined by the first law; and *the entropy of the universe tends to a maximum*, dictated by the second law, as defined by Rudolf Clausius, German physicist and mathematician, who disappeared in 1888. Even so, both of the basic principles of thermodynamics are constant in terms of space and time.

In this way, every physical law is universally valid, no matter where in time or space – as demonstrated by Newton.

With Einstein, this universal principle of space-time would be changed: laws of Nature would depend on the *space-time* continuum.

But if the laws of Nature depend on the space-time, they

will be universally valid for identical conditions of space-time in similar environmental conditions?

John Archibald Wheeler would reply: «we have many reasons to believe that the layers of explanation do not continue indefinitely. For one reason, the *bits* of matter cease to be distinct as we go deeper». That is, the laws of Nature would change in extreme situations – under our point of view; what means that the laws of Nature would change depending on the scale.

If the laws change, then the universe is finite – because change implies discontinuity. And if there was a Big Bang and the universe is expanding, then it will be, again, finite. But how could exist a finite “membrane” for an infinite context?

Would reality be a discontinuous system? Because the mere existence of a Universe would be, in itself, the best evidence of it. But if so, the Universe would be finite and what would exist beyond finite sets? If there is nothing, then it is

infinite.

Norbert Elias in his classic essay *Über die Zeit*, written in 1984, shows us how often we are conditioned by the use of words. Such conditioning, true automatism, finishes by designing many of the concepts and meanings, and among them that one on time.

«The whole reflection on the problem of time is blocked by the form of substantive covered by the concept. (...) ...to think and to express with the aid of reifying substantives is a convention that can make considerably more difficult the perception of the nexus of events», said Elias. That is, the use of substantives that gives a symbolic and universal meaning to something or to some process limits the understanding of the thing or of the process itself.

When we say that the “wind blows” or that “time flies” or even that we can “measure time”, for example, we are automatically assigning senses to the wind or to the time –

senses that doesn't belong to them.

In fact, it is not about the use of substantives in a reifying process, but about metaphor, the illusion of contiguity – which is the product par excellence of the intensification of the verb, of predication.

The origin of our concepts cannot be restricted to a metaphorical process but often, dominated by the verbal universe, we are narcotized by the degenerated relations of the illusion of contiguity, because they belong to strongly hierarchical complexes, where we have the illusion of being their *vanishing points*.

Therefore, narcissus and narcosis share the same etymological origin.

## SIX

*Love someone with all fervor, kiss on her mouth: suddenly, the time stops  
and space cease to exist*

*Erwin Schrodinger*

Norbert Elias identifies a root for the origin of the concept of time: our capacity of synthesis, of association, where memory plays a key role.

Thus, to understand the idea of time, we deal with the nature of memory.

There are two classical concepts either for time or space: or they are containers of all things, and therefore independent

and *absolut*; or they are the result of relations between things, what we call *distances* and, therefore, they will be *relative*.

Interestingly, both concepts seem to be always associated each other throughout history.

In logical terms, the idea of *container*, of a superior entity that is beyond everything, is the same as the *content*, the illusion of contiguity, the metaphor – which is established through a specialized set of visual exercises through the intensive use of the phonetic alphabet.

Thus, literature established the field for the emergence of *flat perspective* and the principles of relativity in physics.

Everything will depend on the metamorphosis in our *sensory palettes*, which are often extremely subtle.

The history of music – which works directly linked to time – shows us some faces of this mutation process in our *sensory*

*palettes.*

What we call *rhythm* seems to have always been originally associated with dance – body movement. The etymological sense of the word dance is exactly to rhythmically move the body.

Thus, the concept of rhythm is born as a reference to the movements of our bodies – like what happens in the concept of time.

In this way, rhythm is nothing more than a form of design of consciousness, a *design of time*.

But rhythm is originally the meaning of time as *before and after*, and not as *past, present and future*.

The word *rhythm* comes from the Greek *rhythmós*, linked to words and *rheo* and *rhein*, meaning *stream, flux*. Hence we have the name of the river *Rhine*, in Germany, of the word

*rhinitis*, or even the word *river* in English.

For Werner Jaeger, the term *rhythm* originally indicated the idea of *pause*, and not of *movement*. Only through the pause we can have the consciousness of movement.

Because of this, Plato defined *rhythm* as *kinéseos taxis*, which literally means *order of movement*. He defined two types of movement as devoid of rhythm: chaotic movements and continuous sounds.

Being *order of movement*, differentiation, rhythm could not exist in an undifferentiated continuum of sound, or in a chaotic complex – revealing an approach very similar to that Claude Shannon would elaborate in his *Theory of Information*.

Only a most intensely visual world is able to create such an abstraction.

Aristoxenus of Tarentum, pupil of Aristotle, who lived



around 330 BC, used the word *rhythm* not only for music but also for visual and spatial works like sculpture or architecture – a habit that remained until the twenty-first century.

Aristoxenus used *rhythm* in a similar way both for music as for poetry, as if both were still connected.

Charisius, a Roman grammarian who lived around AD 400, would give the modern meaning of *rhythm* and *pulse*: *Rhythmus est metrum fluens, metrum rhythmus clausus*, or: *rhythm is the metric's fluency, and metric is the rhythmic link*.

It was a time of great transformations, with the gradual disintegration of the Roman universe, where all visuality of that world seemed to be concentrated, to disappear almost entirely in the next centuries, in some cases transferred to the Arab world.

It was a period that lasted until the early eleventh century, when Europe begun manufacturing paper, quickly replacing

parchment and enabled an intensification of vision associated with the phonetic alphabet.

In the year 1000, the famous Arab philosopher and mathematician Alhazen wrote the book *Perspective*, demonstrating for the first time that the integration of light and the human eye happens with a conical shape, creating the theoretical basis for the birth of *flat perspective*.

It is then that the first polyphonies emerge.

Polyphony is not to have many sounds or many instruments playing together, but yes different *coordinated voices*.

Each *voice* designs a different path, and polyphony happens when those voices converge in a *coherent trajectory*.

Fundamentally, *coherent trajectory* is a visual expression in logical terms.

Thus, for a polyphonic system may exist there must be some sort of visualization of the sounds, which pass to be treated as if they were in space.

In this way, it is possible to treat sounds in their coincidences and mismatches, allowing the emergence of the *counterpoint* – that appeared from the expression *punctum contra punctum*, where *punctum*, meaning *point*, indicated a musical note.

It is when a true diagram of sounds is created, distributing them according to spatial rules, like what happens when we say that something is arranged on a line of development characterized by a structure such as *past, present and future*.

The beginning of polyphony knew a relatively slow development.

Only at the end of the twelfth century, about seven

hundred and fifty years after Charisius and about one hundred years after the first polyphony, a system of musical notation with six different rhythmic modes would emerge – but even then, their patterns of long or short durations yet clearly referred to Aristoxenus.

Europe begun to produce paper more intensively and the first elements in painting announcing the *flat perspective* technology, which would appear in its final form about two hundred years later through Filippo de Bruneleschi's hands.

In the thirteenth century Franco de Cologne appeared. He was a German scholar and probably also musical composer, who introduced, through his work *Ars Cantus Mensurabilis*, written in circa 1260, a profound revolution in musical notation through which the *shape* of each note passed to indicate, for the first time, its duration in time.

Such revolution in music would be known – after musicologists in the nineteenth century – as *mensural*

*notation.*

It is a technique with essential elements for the coordination of musical instruments articulating different *voices*.

The word *coordination* precisely indicates the idea of *ordination*, which in its etymological origins means *to weave* and then *to put in order*, which added to the Latin *co*, indicating the idea of *two*, of a *parallel set*, results in the sense of an *ordination in parallel*: what is an exclusively visual possibility, never acoustical.

It was then that the first paved roads and streets appear in Europe after the fall of Rome.

After Franco de Cologne, the brilliant Philippe de Vitry, a great friend of Petrarch – who was not only the great announcer of the phenomenon of the *individual* but also an insistent advocate of punctuality – would be the first to clearly

distinguish between double and triple metrics in his famous treatise *Ars Nova*, dated of about 1322.

Three years before, in 1319, Johannes de Muris – also a friend of Vitry – had launched the book *Ars Novas Musicae*, where he stated: «Therefore, the voice must necessarily be measured by time. It is particularly the time of the measurement of movement. But here time is the measurement of the voice that is produced by ongoing movement: the same however is designated as a definition of time and unity».

In that same treatise *Ars Novas Musicae* Muris wrote: «Time can be split into many equal parts, which are brought to light. The whole continuum is divisible into many parts in any proportion, as in two, three, four etc. Time is that kind of continuum. Consequently, it can be divided at will into equal parts». Muris doesn't talk about divisions made in *different parts*.

The passage between the *Ars Antiqua* and the *Ars Nova*

established by Vitry reveals an essential element related to time and music.

In *Ars Antiqua* there was the *perfectum mode* – which is related to the Catholic doctrine of the Trinity – where the *long* note would be divided into three *breve* notes. *Ars Nova* introduces the *imperfectum mode* as standard, where the long note is divided into two *breve* notes.

Then, the number *two* replaced the number *three*. All acoustic cultures seem to have the circle as an essential logic element – not as a symbol, as what happened with Plato or even with Pythagoras.

The circle is, in logical terms, the essential reference of non-differentiation in visual terms. Three points define the smallest synthesis of a circle. That is, to draw a circle, not knowing its central point, three points will be enough.

On the other hand, the division into equal units and the

binary system are primarily visual – the phenomenon of *systasis* is the most sublime expression of this type of event: each visual framework taken as a *totality*, the division between the seer and the object of his vision, and so on. This is, in logical terms, the essence of the principle of repetition.

And it would only be with Philippe de Vitry that the called erudite music would free itself from the Church. In 1325, Pope John XXII exploded his fury against the *Ars Nova*, prohibiting its performance in the churches: «They hurry, and they do not rest; they intoxicate the ears, instead of calming them; they rush about without rest – they disturb devotion instead of evoking it».

One hundred years later, *Ars Nova* was already being regularly performed in churches.

Eight years after the appearance of *Ars Nova*, in 1330, Jacques de Liège launched the spectacular treatise *Speculum Musicae* – the most voluminous theoretical corpus on music



throughout the Middle Ages.

It is a treatise devoted to polyphony – having in its title the word *speculum*, *mirror*, which is typically visual. In that epoch, Europe witnessed an explosion in the manufacture of mirrors – which led some thinkers to consider that their proliferation probably was the triggering factor of *flat perspective* technology.

It is the time of the emergence of the *flat perspective* and of Gutenberg's movable metal types press – when everything gradually becomes more and more visual. Thus, the measure of time in music becomes more and more precise, allowing a combination of larger and more complex sets of musicians – following the same principles of the spatial distribution in architecture.

However, it would be only in the seventeenth century – Galileo's epoch – that a broad process of normalization of rhythmic musical notation would happen, eliminating

complications, simplifying and standardizing.

Until then, *time signatures* – as well as patterns of pitch - which could be found in musical notations between the thirteenth and sixteenth centuries were not binding but only indicative and flexible.

The lines of division between bars – which enabled a more accurate reading of time – would be introduced only in the sixteenth century, originally for lute and keyboard music, becoming widely used in the next century.

Marking time in music performances started to be used more regularly after the early Baroque. Not all instrumental musical pieces required time marking.

In the beginning, the orchestra conductor used a big stick, which worked acoustically, beating the pulse on the floor. Gradually, the shape of the stick diminished, becoming in the baton, visually marking the time.

Johann Sebastian Bach, who lived between 1685 and 1750, often left blank the tempo in his compositions. The tempo indications found in many of his scores today were made by different copyists over the centuries. Not infrequently, Bach left tempo free for the interpreter's choice.

It fell to Beethoven, who lived between 1770 and 1827, the role of being the first to include rigorous metronome marks in the scores instead of descriptive phrases, as was customary, starting the implementation of a rigid standard of tempo.

Thus, an *andante grazioso* became precisely 120 – indicating one hundred and twenty beats per minute, and a *lento* movement, which might vary from forty to sixty beats per minute, passed being designed as 45 or 55, for example.

And it was with Beethoven that the formation of the orchestra expanded to the dimensions that were common until the beginning of the XXI century: changes due to a matter of

time.

By observing this transformation over the centuries, we wonder about the relation between the notation of time and the capacity of memory.

In 1982, researchers at North Texas University conducted tests with graduate students in order to understand if the music would help the memorization of words. They concluded that when the reading of words was integrated in a song, its memorization was much better. In this experiment, they also found that time was an important factor in memorizing. Environments with a clear time *design* facilitate memorization.

Ten years later, in a 1992 article entitled *Music-dependent Memory in Immediate and Delayed Word Recall*, written by William Balach, Kelly Bowman, and Lauri Mohler, from the State University of Pennsylvania, developed researches about the influence of music and the structure of time on the capacity of memorization. They discovered that the music genre didn't

exert a substantial difference on people, but time did.

The expansion of production – an explosive growth – of books after the fifteenth century, true amplifiers of memory, coincided with the determination of strategies increasingly accurate in the design of tempo in music, influencing the ability of memorization.

As if we were dealing with a deeply integrated phenomenon, like a virtual organism.

# FIVE

*For humans, time passes  
For time, human beings pass*

*Ancient Chinese proverb*

One of the hottest debates in the seventeenth and eighteenth centuries happened around the nature of space and time. On one hand, most religious spirits like Newton, convinced of the supremacy of fate, defended space and time as absolute entities, species of divine substances.

On the other hand, the famous epistolary debate between Leibniz and Newton, and later the thought of Kant, would unveil the other face: time and space as relational products.

The great revolution of Minkowski, and after him, of Einstein – which coincides with the emergence of immaterial media such as radio and telephone – is in the overcoming of that process, the elimination of space and time as antagonistic figures, making them into a single element.

While concepts, space and time are products of writing – and for no other reason, it is only with it that we have what we call *history*.

If the idea of *time* seems to arise with the emergence of language, in the establishment of the sepulture, of the symbolic recognition of death; the concept of linear time as an entity with a precise and stable relation between *past*, *present* and *future*, established as a strongly predicative path structured on discrete elements diachronically disposed in a continuous flow, seems to arise with writing – because it shares with it the same logical structure.

Like the space and the time, many other ideas seem to be aggregated to this floating polar domain: fate or free will, causality or chance, and so on – all seeming to be launch at common logical root.

Here, a complex equation is designed. Acoustic societies have more restrictions in terms of systems for long-term memory support and therefore tend to establish parallel realities both for time and for space. In such scenario of low level of long-term memory and high rate in the use of short-term memory, everything is inexplicably inevitable – it is inexplicable, because it is incomprehensible without the formation of the bigger picture – and therefore everything is condemned to destiny.

Moreover, literature is a technology of memory storage par excellence, being a true amplifier of long-term memory, establishing a large complex of relations and, consequently, enabling the understanding of complex processes.

For oral societies, time – coined by its structures of short



and long term memories – works as alternation of opposites, because only difference produces consciousness; and have a linear nature, because the second fundamental law of thermodynamics is present in everything, even if manifested as parallel times – like the crops, of the Sun or the seasons.

The text of *The Category of Time among the Krahô* – Brazilian Indian society – by the anthropologist Júlio César Borges, illustrates how this happens.

Edward T. Hall, in one of his most fascinating books, *The Silent Language*, of 1959 shows how the concept of time is something we learn, like to read a text or to play a musical instrument.

And in the same way that happens with music or with learning different languages, the concept of time when learned since the first years of life specializes neuronal groups, which otherwise would be colonized by adjacent areas.

So the person who learns a concept of time later will live it differently from who structured it in the early years of life.

In literate societies, the concept of *time* works as a complex where everything is related in a coherent and unique whole. Here, like what happens with the phonetic alphabet while logical structure, all events are arranged according to a strongly hierarchical and predicative principle of order, where each person and each thing has *its place*. It is then that the principle of *free will* emerges.

While for the oral societies time is an absolute whole resultant from the alternation of opposites, where everything is integrated relation in a *totos*; for the societies pertaining to the universe of writing, time is *container* and *totality*, where its sense while absolute entity is the result of a framework of relations with a specific logical design.

While for oral societies the absolute is a *totos* that absolutely implies its parts, for a highly visual and literate

society, the absolute is a *totality* relatively independent of its parts.

If we take the universe of acoustic societies we will perceive that they are closer to the idea of an absolute time while *totos* and of an inevitable destiny. This was characteristic in the ancient Mesopotamian and Egyptian worlds, for example, yet not intensely visual.

Gradually that tendency changed with the emergence of the Greco Roman world. It returned to be closer to the fatalism in the called High Middle Ages, and once again returned to the free will with the Renaissance, the Enlightenment and the Industrial Revolution.

The debate between Newton and Leibniz is especially interesting because both disagreed about structures of a same type of time: something divisible into uniform units. The fundamental difference between them was to know if time was a *container* or the result of its internal relations.

To Leibniz, time was the product of the relations between all things; to Newton, it was a container of those relations, independent and sovereign, like a kind of metaphor, in logical terms.

However, even for Leibniz, time was not consequence of total relations between all things, like what happens at the oral universe, but rather the product of different specialized relations, independent of each other.

Thus, they dealt with a same kind of time.

When we have in mind an axis that is established between a single conception of *single time* and another one of *parallel times*, we find the latter as characteristic of the Mesopotamian universe.

It is a concept that is present in the structure of myths and even in the distribution of information on the tablets written in

cuneiform, and very especially in the archaic cuneiform.

In ancient Egypt, in a similar way to what happened at the Mesopotamian world, times were multiple and parallel. A same fact could happen several times, and even in a contradictory way, in a myth.

Achtner, Kunz and Walter identified four fundamental basis for the idea of exogenous time in the ancient Egypt: the Sun, which divided the day and that constituted the year; the Moon with its cycles marking religious rites; Nile floods, coordinating the economic universe; and the rise of the star Sirius, marking the summer solstice.

It is usually forgotten that the time of pregnancy is measured in nine lunar months.

More visual, the time reported in the biblical Old Testament, although it had a stronger sense of unity, still is that one of the seasons, of the rain, hard times, crops and so on.

That doesn't mean that a division of years, months, days or hours was not present in the Egyptian or in the Sumerian world.

In ancient Egypt, time apparently wasn't divided into segments. The word *at* – which is generally translated by *instant* – didn't correspond to any defined duration. Religious belonging to a specialized group were known as *ounouyt* – word derived from *ounout*, Egyptian term used for *hour* – and were probably responsible for knowing the time and the hours of the day.

An official at the kingdom of Pepi I, third pharaoh of the sixth dynasty, who reigned between 2332 and 2283 BC, wrote that he was very careful counting all the hours of work required by the State, in the same way he also counted the food, livestock or other items that would be taxed.

But the conception of time – not existing yet a specific meaning for it – was that of parallel and multiple times.

The ancient Hebrew universe had three words to describe time. Each one of them indicated a quality. For the ancient Hebrews, past was ahead the person while the future was behind him. The word *Olam* meant a time too distant in the past or in the future and that, for this reason, is very difficult to be captured. In its turn, *et* meant a specific event at a determined time. Finally, *roega* indicated a moment, a short period of time.

Achtner, Kunz and Walter clarify the temporal nature of this universe, whether Sumerian, Egyptian or Hebrew: «the Hebrew language did not approach the phenomenon of time through abstract thinking. Rather, all investigations agree that the specifically Hebrew understanding of time was always articulated in the context of certain events or human activities».

As Norbert Elias alerted, «in the ancient world, the social enclaves implanted by humans within the natural environment

are still poorly understood. (...) More human enclaves gain in size and relative autonomy – in favor of processes such as urbanization, commercialization and mechanization – more they become dependent, to measure time, of artificial devices, and less they rely on natural scales of time measure, like the movements of the Moon, the succession of seasons or the pace of high and low tides».

This happens gradually and is associated to another process: the *design* of our minds.

In Egypt, for example, the tomb of Tutankhamun – who ruled nearly three thousand and four hundred years ago – reproduces the figure of twenty-four baboons, representing twenty-four hours of a day – because the Egyptians observed that baboons have a habit of urinating regularly at intervals of about an hour.

Even so, despite these divisions, the general structure of time both in Mesopotamia and in ancient Egypt, was similar to



that described in the Old Testament.

Gradually, the old idea of parallel times became in the ideal single time of the Greco Roman world, with a causal nature, to dive back in the old image of parallel times during Middle Ages.

It is also true that in the Middle Ages, in a certain sense like what happened in the ancient Egypt, monasteries dealt with an idea of time that had a different nature from the existed among people in general. In monasteries the concept of time was that of the book, of the clepsydras and of the bells.

In the seventh century, a bull from Pope Sabiniano determined that the bells in churches should obligatorily play seven times at every twenty-four hours. They were the called *canonical hours*.

But it would be necessary the introduction of paper manufacturing technology replacing parchment – slower and

less flexible medium – so that time could again be, in general, structured in a uniform complex of stable relations.

Then, gradually, the idea of a single, standard and universal time began to emerge.

Because of that, it would be only with the beginning of papermaking in Europe that the idea of an abstract time, which would be beyond the events of the daily life, would emerge once again – but now with stronger impulse.

Only a more intensified exercise with the phonetic alphabet through the use of paper, projecting a strong predicative structure, was able to generate the effect of the abstraction of time.

Thus, Albert the Great, who lived between 1200 and 1280 – and who was master of St. Thomas Aquinas – would be considered the first medieval philosopher to defend the existence of a physical and concrete time – a concept that

requires a great power of abstraction.

He said that «what depends on the soul is not the existence of time, but its perception».

Curiously, the idea of time that designed the Western world is highly visual and abstract in nature, unlike of that which characterized the Eastern universe, traditionally designed by integrate and olfactory systems, like the use of incenses to set moments of the day or of the year.

Even with clepsydras, designed as permanent movements, the perception of time in the Eastern world was about a powerful metamorphosis of a continuous stream.

East dominated the manufacture of paper, but lacked the phonetic alphabet.

After the Renaissance, until we arrived to Newton, the concept of time was becoming increasingly *unique* – even

considering the difference between time as container or as product of specific relations.

Plunging back into the past, we find the idea of a profoundly absolute time, a *totos* far beyond of a *totality* – that was the *deep time* in the ancient Mesopotamian societies – and which was developed towards the profane and relational time of Aristotle's universe.

In his *Physics*, Aristotle gives us the definition according to which time is «the change or some aspect of it; because it is not possible to be the change itself, then it is some aspect of it... We can not only measure the movement by time as well as the time by the movement».

And however, Aristotle argued that the time is «a measurement of the movement towards the before and the after» in the fourth Book of his *Physics*, the very idea of *measurement* and its relational dimension – otherwise it would not be *measure* - implies the emergence of the concept of *past*,

*present and future.*

Marshall McLuhan argued, in his celebrated *Understanding Media*, that «great cultural changes occurred in the West when it was found possible to fix time as something that happens between two points. From this application of visual, abstract, and uniform units came our Western feeling for time as duration. (...) Such a sense of time as duration is unknown among non-literate cultures».

Thus, the time – which, paradoxically, until then was many times taken as something supernatural – became, with Aristotle, the result of direct action of other elements, but while a standard result, a sort of universal *measure*.

Unlike what is generally believed, when time is relative it also becomes *unique*, but not a *total* and yes a totality. That is the lesson taught by the invention of the *flat perspective* technique. In it, all images are part of a *coherent whole*, and each one of them becomes unique, in the same way that a

person becomes an individual inside a universe of *perspective* nature.

However, in the Sumerian universe, for example, *deep time* wasn't a human, individual or chronological time. It was something that was beyond the human – a notion that, by subtly different ways, Greece would adopt as the meaning for *eternity*.

Much before Aristotle, that was especially present in Greece of the sixth century BC with Anaximander, a pupil of Thales, and its concepts known as *apeiron* and *peras*.

The word *apeiron* means *unlimited, totos, quality*. On the other hand, *peras* indicates the idea of *limit*, of the *concrete existence*. All concrete existence is, necessarily, subject to the *limit*.

This also was the relation between the ideas of *deep time* and of *parallel times* in the ancient Sumerian world.

Anaximander would also be known as the introducer of the *gnomon*, the sundials, in Greece. In addition to this introduction – in relation to which the Greek thinker may have been an important promoter rather than a truly introducer – he would have developed the *gnomic circle*, the ancestor of the dials of our clocks, which is a kind of map of the celestial dome divided into twelve or twenty-four parts.

It is not to wonder about such an identity between the ancient concept of time among Sumerians and the cosmic ideas of Anaximander.

A little later, already equipped with more refined visual cognitive tools – like the papyrus and the phonetic alphabet – the Greek world expanded in its complex of language – verbal or nonverbal – a network of structural relations *outside* its object. A network of relations with a kind of *vanishing point*, projecting a uniform, hierarchical and stable system to all its elements.

The physicist and philosopher Robert Logan, from the University of Toronto, a friend of Marshall McLuhan, said in his book *The Alphabet Effect*: «Perhaps the most striking effect of the alphabet was the great number of new abstractions that appeared almost simultaneously. The written word is a further abstraction of the spoken word, and phonetic letters give it an even greater abstraction than ideographs or pictographs. The use of the alphabet thus involves a double level of abstraction over a spoken word, because the transcription of a spoken word takes place in two steps. A spoken word is first broken up into of semantically meaningless phonemes or sounds, and the sounds are then represented by semantically meaningless signs, the letters of the alphabet. (...) Under the influence of alphabet literacy, Greek writers created the vocabulary of abstract thought that is still in use to this day, notions like body, matter, essence, space, translation, time, motion, permanence, change, flux, quality, quantity, combination, and ratio».

Virtually, two lines of development characterized all



writings: the called *lapidary* – that in the Latin alphabet, also known as Roman alphabet, was named *unicial* – and the *cursive*. The first was written on slow and inflexible media like stone; and the second on fast media such as parchment or papyrus.

Different media generated different kinds of writing and of concepts.

It is the scale generated by the fusion between a fast medium and the phonetic alphabet that enables the emergence of a universe especially rich in abstractions.

Thus Xenophon – who lived around 400 BC and who was a follower of Socrates's ideas – would say that «there is only one God who prevails as the greatest among all gods and people, who is not similar to mortals neither in appearance nor in thoughts».

It is in such universe that the concept of tragedy is born. It is here, again, that the idea of *moira* emerges – meaning destiny

– also known as *mere*. Originally, each person would have his or her own *mere*. Later, this concept became universal.

*Moir*a consisted of three sisters: *Atropos*, *Clotho* and *Lachesis*, who controlled the human life by a thread that the first wove, the second rolled and the third cut: *birth, life and death, beginning, middle and end, past, present and future*.

Atropos was the mother of Locro, lover of Zeus; Clotho was the daughter of Atlas; and Lachesis was the female dog of Icarius – who, according to myth, introduced the wine in Attica.

Only when the concept of *free will* emerges, the consciousness of destiny becomes possible.

So the idea of destiny, *tragedy*, becomes the *content* of the new medium.

From the word *mere*, or *moira*, the verb *marmárein*

appears, meaning *to shine*, as a reference to Sirius.

Sirius is the brightest star in the nocturnal sky, it is located in the constellation *Canis Major* and can be seen from any point on Earth. Greek mythology tells that Orion's hunting dogs have ascended to heaven and became Sirius. The ancient Greeks associated Sirius to the maximum heat in summer, and hence the expressions *canicula* and *dog days* arose.

The Greek word *moira* appears from the Indo European particle *\*m*, which indicates the ideas of *measure* and *limit*. As to designate destiny while an expression of *measure* and *limit*.

Because of this Robert Logan argued that «statements in the oral tradition must be made in the context of events in real space and real time. It is only with alphabet literacy that timeless analytic statements emerge that can express universal truths independent of the context in which they occur».

It's only inside an environment *out of time*, only when

time disappears, that we can have consciousness of it, that we can elaborate it.

There are other key elements that would have designed the establishment of that new logical framework by the Greek world, such as the *heating* of the phonetic alphabet with the inclusion of the vowels, the establishment of the definite article as an important element for the structuring of the verbal discourse, the intensification of predication and so on.

These elements emerged from the intensive use of phonetic alphabet and papyrus which, being a fastest and more flexible medium, allowed the quick intensification of the use of verbal language in silence, turning more dynamic long-term memory and amplifying the differential principles of language, making them an essential part of the structure of thought.

This is a process so revolutionary, efficient and economical that the so-called *Roman alphabet* – which according to legend, was created in 753 BC – would continue being virtually used

around the world, like in this book, almost three thousand years later. It is regularly used even in Japan or China, when not using the ideogrammatic system.

The *Roman alphabet* is derived from the Etruscan, which in its turn was born from the Greek alphabet.

Even so, papyrus wouldn't be sufficiently flexible, cheap and fast as a true *flat perspective* could emerge in the ancient Greco Roman world.

There were, then, other techniques of perspective that established a step closer to the future logical elements of the Italian Renaissance – but not sufficiently uniform yet.

In a *flat perspective* all points have a uniform value in relation to the network structured by the *vanishing point*. Everything has a well-defined identity. Because of this, the logic at the root of the flat perspective technology is the responsible for the emergence of the sense of *individual*, so lucidly perceived

by the genius Petrarch.

Time, in a *perspectivic* mind structure, is a web of causal relations with uniform values, supported by a process designed by a *beginning, middle and end* – as well as by a *past, present and future* inside a strongly predicative chain.

That is why only inside such a mental structure – albeit without the intensity that characterized the world after Gutenberg nearly two thousand years later – it was possible to emerge the concepts of *isonomy, democracy, literature and history*.

Other elements, of different nature, reveal us the logical indicators of such metamorphosis.

In the ancient Egypt, the technique to make a painting or a sculpture required the prior establishment of a tram of parallel lines, forming equal units. That net was superimposed on the surface to be worked and served as a kind of essential

support for painting or sculpture.

The nature of the relation between the object and the surface was that of *similarity*. Of course, it is *similarity* taken while logical principle and not as an indicator of a possible photographic *verity*.

Represented thing and representation were distinct elements.

When predication is intensified due to more frequent usage of papyrus and phoneticalphabet, the illusion of contiguity emerges. With it we passed to believe that something really is the other one. That is the magic of metaphor.

Thus, in the Greek world, the technique of preparation of wall paintings and sculptures was no longer based on a network of lines designating equal units and became being established by the proportion – and *proportion* implies a body of references that will provide the order of relations between

different measures.

It is in this universe that an initial impulse to the *individual* emerges, and it would be much more intense at the epoch of Enlightenment, in the eighteenth century.

It is the illusion of contiguity that produces the idea of *individual* – a kind of *content of identity*.

And it will be in that strongly *perspectivic* context, still at the Greco Roman world, that time will become product par excellence of causal relations established in a coherent and uniform complex.

Later, with Rome's loss of control of papyrus production, gradually, the predication, the illusion of contiguity, and the mental *perspectivic* structures disintegrate and Europe entered a period known as that of *darkness*, of *non-vision*.

Curiously, the elaboration techniques of painting



and sculpture during the Middle Ages passed to make use of conceptual resources very similar to those that had characterized the ancient Egypt. However, now no longer as a uniform network of units, but as generative networks formed by regular polygons.

Villard de Honnecourt's drawings are a classic example of how it happened.

It is then that the concept of *time* became again that of *parallel times* – Sun, Moon, seasons, cycles of ages – like those described in the Old Testament.

The Renaissance universe emerged with *flat perspective* – but also, and before it, with the paper, which replaced papyrus, and immediately with Gutenberg's movable metal types press.

At the end of the Middle Ages and beginning of the Renaissance, a new concept of time appears, much more visual than that emerged in the classical world.

## FOUR

*When you sit with a nice girl for two hours, you think it's only a minute.  
But when you sit on a hot stove for a minute, you think it's two hours.  
That's relativity.*

*Albert Einstein*

Only with the beginning of papermaking in Europe, around the year one thousand, the word *time* appeared with its modern sense. And only about one hundred years later, already in the twelfth century, the word *clock* would appear.

Our word *hour* was born from Greek expression *hōra*, which indicated all temporal division, whatever it could be

– since the division of day and night as well as the change of seasons, years or months. When it assumed its modern sense, indicating only a fraction of the day or night, it also meant *now*, indicating the *present time*.

Again, like what had happened at the Greco Roman universe, after the late Middle Ages measures in painting and sculpture ceased to be drawn from a uniform network of units and began to be designated by the *relations between things*, taking every thing as a model in itself, as models of structural relations.

Predication was again intensified and not only the concept of *individual* appeared, but also that of *genius*.

*Time* was again a consequence of the action inserted in a context and thus it became something so relative as absolute.

Until then, being the society most acoustic, the notion of *time* turned around *before and after*. Only this conception

of time while *before and after* works within a continuum, as it is the case of diachronic processes, fundamental element of hearing.

When the society becomes more visual and predicative, the figuration of time while *present, past and future* emerges – which is equivalent, in logical terms, to *subject, verb and predicate; father, son and holy spirit; beginning, middle and end* and the principles of flat perspective.

It is then that *history* emerges as a highly specialized technology of civilization.

Norbert Elias made a very interesting observation on this phenomenon: «The demarcation lines between past, present and future are constantly changing because the subjects for whom these events were past, present or future become or are replaced by others. They are individually transformed on the path that leads them from birth to death and collectively through the succession of generations».

This approach to an *individual transformation on a path that leads from birth to death* is strongly visual in logical terms.

Despite its apparent consistency, this figuration, an almost metaphorical conception, is clearly contradictory. The future only happens while past – when it will exist, will cease to be future. In its turn, past only can exist in its future, we speak and realize the past when it no longer exists, when it is in what is its future.

Such a notion of time while *present, past and future* makes possible the emergence of the concept of a present that runs on a *timeline*.

The concept of *past, present and future* only imposes itself in moments when the society is more heavily *visualized*. When the ear is sovereign, the idea of *before and after* prevails.

These two types of approach to the concept of *time* generated a true intellectual battle after the first years of the twentieth century, and especially having as basis two essential texts: one by John McTaggart Ellis McTaggart and another one by Bertrand Russell.

McTaggart was a British philosopher who lived from 1866 to 1925, Hegel scholar and teacher of Bertrand Russell. In a controversial article titled *The Unreality of Time*, published in the journal *Mind* in 1908, McTaggart argued that time is nothing but an incoherent illusion.

In that text, the English philosopher introduced the notion of *Series A* and *Series B* for the understanding of the phenomenon of *time*. *Series A* indicates the formulation of *past, present and future*. *Series B* refers to *before and after*.

Even considering *Series A* as essential for the establishment of any complete theory about time, it is in itself paradoxical and therefore indicative of the unreality of time.

«I believe that nothing that exists can be temporal, and that therefore time is unreal», (...) «the distinction of positions in time into past, present and future is only a constant illusion of our minds, and the real nature of time contains only the distinctions of the B Series», but – McTaggart continues – «it seems to me that the A Series is essential to the nature of time, and that any difficulty in the way of regarding the A Series as real is equally a difficult in the way of regarding time as real».

And, according to him, even the Series B would be, in last instance, impossible to exist, because «as the B Series depends on permanent relations, no moment could ever cease to be, nor could it become another moment». That is, the *now* – product of *before and after* – could not *move* in time, because if yes it would inevitably imply the Series A, which is in itself a paradox. «So it follows that there can be no B Series when there is no A Series, since without na A Series there is no time».

Bertrand Russell, his student, wrote many years later,

in 1935, an article which was entitled *On Order in Time*, where he argued that the instants in time may not be object of mathematical construction and that, in this way, only the *Series B* – the meaning of time as *before and after* – would be admissible as truth.

He starts the article arguing that «an instant is most naturally defined as a group of events having the following two properties: 1. Any two members of the group overlap in time, i.e. neither is wholly before the other. 2. No event outside the group overlaps with all of them. (...) The existence of instants can be proved on various assumptions. One of these is that events can be well ordered. There is, however, no reason, either logical or empirical, for supposing these assumptions to be true. If they are not, instants are only logical ideal, to which, as we shall see, it is possible to approximate indefinitely, but which cannot be reached. (...) To sum up: when the whole class of events can be well ordered, and also when methods exist of constructing certain kinds of well-ordered series of events, the existence of instants can be proved. But in the absence of such



possibilities, I do not know of any way of proving the existence of instants anywhere if it is possible that all the events existing at the beginning of some event (or at the end) continue during a period when others begin and cease (or have previously existed during such a period)».

That is, the *Series A* would be impossible - only the *Series B*, *before and after*, could indicate the idea of *time*.

In *Mysticism and Logic*, written over twenty years before, in 1914, Bertrand Russell said: «The arguments for the contention that time is unreal and that the world of sense is illusory must, I think, be regarded as fallacious. Nevertheless there is some sense – easier to feel than to state – in which time is an unimportant and superficial characteristic of reality. Past and future must be acknowledge to be as real as the present, and a certain emancipation from slavery to time is essential to philosophic thought. The importance of time is rather practical than theoretical, rather in relation to our desires than in relation to truth. That this is the case may be

seen at once by asking ourselves why our feelings towards the past are so different from our feelings towards the future. The reason for this difference is wholly practical: our wishes can affect the future but not the past, the future is to some extent subject to our power, while the past is unalterably fixed. But every future will someday be just what we now see it to be, and what is now future must be just what we shall see it to be when it has become past. The felt difference of quality between past and future, therefore, is not an intrinsic difference, but only a difference in relation to us: to impartial contemplation, it ceases to exist... Whoever wishes to see the world truly, to rise in thought above the tyranny of practical desires, must learn to overcome the difference of attitude towards past and future, and to survey the whole stream of time in one comprehensive vision».

Quickly two large opposing groups searching the meaning of *time* were formed. On one side, were philosophers defending the *Series A* as fundamental to understand what is time. On the other side, there were philosophers defending the

*Series B.* Some took as fundamental both series, even with all the paradoxes, to understand the meaning of *time*.

*Series B* – everything transiting between *before and after* – is the fundamental notion of time in acoustic societies. Because of this, there are the called *parallel times*. In literate societies, the visual structure normalized relations, eliminating the sensation of the paradoxical. McTaggart lived the epoch of the first emergence of the photography, the phone, the impressionism and the electricity. It is not to wonder that he had felt the paradoxes inherent in that two basic conceptions of time.

In the battle of the twentieth century on the difference between McTaggart and Bertrand Russell, on one side there were the *Theorists A*, philosophers like Quentin Smith, Charlie Dunbar Broad, Storrs McCall, George Schlesinger, Michael Tooley and William Lane Craig among others. On the other side, the *Theorists B* like Nathan Oaklander, Robin Le Poidevin, Hugh Mellor, Donald C. Williams, Adolf Grünbaum, John Jamieson

Carswell Smart and Heather Dyke among others.

In this great battle of ideas, many concepts about time have emerged.

William Craig developed a *pure Series A*, which would be known as *presentism*. According to this theory, only the *present* could exist, everything else would simply be inexistent. Being everything *present*, the paradoxes pointed by McTaggart would automatically be eliminated. For Craig «the doctrine of objective becoming could be graphically displayed as the successive actualization of the history of the actual world. It is this model of a successively instantiated, rather than tenselessly existing, actual world that precludes the existence of a ‘totality of facts’».

Also to Mark Hinchliff, as Craig believes, the whole issue of time can only be understood as *present*.

Quentin Smith proposes a hybrid formula for the *Series A*

and *B*. According to him, a past or future fact would happen as different types of present, in an infinite number of relations.

To Michael Tooley, time is revealed after the principle known as the *open future*. That is, according to this thesis, only past and present could exist, not the future. Thus, the future is *open*, non-existent. The future would only be a pre-vision, which happens as past.

John Bigelow proposed a solution for the elimination of the paradoxes pointed out by McTaggart: a hypothesis according to which we would not be dealing with moments transiting on a timeline made of *past, present and future*, but yes made of different possible worlds.

To Bigelow everything would be, like to Hinchliff and Craig, only present, but each present would be a possible world: «The past no longer exists; yet there is a sense in which the past can never be lost: the world will always be one with the property of having once been thus and so. Likewise the future does not

exist yet; yet there is a sense in which the future will be what it will be: the world has always been one with the property of being a world which is going to be thus and so. At any given time, you can grasp truths which transcend your present and describe the world *sub specie aeternitatis*, from the standpoint of eternity».

But if everything would exclusively be a continuous succession of *presents*, then any temporal relation between them would be, again, a paradox.

To solve this dilemma, Barry Dainton proposed the hypothesis of a *compound presentism*. Thus, «the sum total of reality consists of at least two coexisting very brief reality-slices», according to Dainton.

In the late twentieth century, Nathan Oaklander proposed, along with other philosophers – and more particularly with Carswell Smart and Hugh Mellor – a *New B Theory*, to eliminate possible contradictions found in *Series B – before and after* –

defended by Russell.

Interestingly, all questions in this formidable battle are oriented according to the principles of verbal language and, more specifically, of writing. They are often almost purely linguistic exercises.

But the great division between the two groups is in the belief that time exists or not. To the *Theorists A*, McTaggart was right and time simply does not exist. For *Theorists B*, followers of Bertrand Russell's thought, time is a concrete entity.

In 1986, Delmas Lewis launched a paper called *Persons, Morality and Tenselessness* according to which the *Series B* would eliminate the principle of responsibility: «1. If a person is to be held responsible for a past action, then he must be the very same person who performed that action. That is, responsibility presupposes that a person is an enduring entity persisting through change. 2. According to the tenseless – B Series – view of time, however, 'a person is not an entity

enduring or persisting through change, because there are no such entities on this view'. 3. Therefore, on the tenseless view persons cannot be held responsible for their actions».

Thus, Lewis concludes that «any philosopher who holds that we are sometimes responsible for our actions has a conclusive reason to reject the tenseless view of time».

It is an argument that ignores the principle of *autopoiesis*. Not only, and very interestingly, the whole gigantic battle between *Series A* followers and *Series B* advocates – as well as the logical impossibility of union of the two principles – seems based on the ignorance of *autopoiesis*.

Autopoiesis etymologically means *self-creation* – but this is not about *self-regulation* or *self-organization*. Humberto Maturana and Francisco Varela introduced the concept in 1972. It means something that is in itself the organization, that is, something whose order, or principle of differentiation, coincides with its own organization. So, such thing can be interacting with



other systems without losing the identity.

Going one-step further, it means also that the *autopoiesis* indicates the possibility of to be and not to be, of being in constant interaction and change, but remaining the same system.

And, contrarily to what some people think, time – in its various forms – doesn't appear as a way of orientation developed by humans to fulfill certain well-defined social functions. It emerges as a result of a cognitive process.

But that doesn't mean that time is a phenomenon isolated of the world, as some purely subjective, intimate and inner thing – as designed by Husserl in his famous book *On the Phenomenology of the Consciousness of Internal Time*, with texts from 1893 to 1917. Even in Husserl, took with more attention, it is evident his approach to the subjective as a kind of projection of the objective, fragment of it. As if he had defined a delimited portion of the reality to be studied, as if such portion

would bring in itself the seeds and the keys of the whole.

Edmund Husserl is considered the founder of phenomenology, and decisively influenced many thinkers like Martin Heidegger, Jean-Paul Sartre, Emmanuel Levinas, Maurice Merleau-Ponty, Kurt Gödel, Paul Ricoeur, Jacques Derrida, and Francisco Varela among others.

The first Husserl's conferences on phenomenology – *The Idea of Phenomenology* – published posthumously, happened in 1907. Husserl considered phenomenology as the scientific study of the essential structures of consciousness.

Charles Sanders Peirce had a similar idea, to what he called *phaneroscopy* – from the Greek *phaneron*, root of the word *phenomenon* and that means *light*, because only vision turns possible an artificial separation between *interior* and *exterior*, and thus a phenomenological approach. «Phaneroscopy is the description of the *phaneron*; and by the *phaneron* I mean the collective total of all that is in any way or in any sense present

to the mind, quite regardless of whether it corresponds to any real thing or not», Peirce wrote in 1903.

Like for Charles Sanders Peirce, also for Husserl the experience was the basis of any knowledge.

Husserl was attentive to the world while thought.

In his reflection on the time, Husserl warned: «We are intent on a phenomenological analysis of time-consciousness. Inherent in this, as in any phenomenological analysis, is the complete exclusion of every assumption, stipulation, and conviction with respect to objective time... (...) When we speak of the analysis of time-consciousness, of the temporal character of the objects of perception, memory, and expectation, it may indeed seem as if we were already assuming the flow of objective time and then at bottom studying only the subjective conditions of the possibility of an intuition of time and of a proper cognition of time. What we accept, however, is not the existence of a world time, the existence of a physical duration, and the like, but

appearing time, appearing duration as appearing. (...) Temporal apprehensions, the experiences in which the temporal in the objective sense appears, are phenomenological data. (...) But none of that has to do with objective time. One cannot discover the least thing about objective time through phenomenological analysis».

In last instance, everything we know is phenomenon. Any so-called *objective reality* belongs to the way we understand the world, belongs to the universe of knowledge, to the processes of formation of *schemata*, to logics and aesthetics.

Concrete reality never is entirely permeable to knowledge – if it was there would be no knowledge, but the thing itself.

Knowledge is, by its own nature, always partial.

A possible ontology of time is a curious illustration to show how this happens.

If the phenomenon had nothing to do with its object, if it could be separated from it, as if it was something epistemologically diverse, then there wouldn't be cognitive stability, because we would be dealing here or there with closed systems and science, like art or even communication, simply would not be possible.

Then, Husserl works on the *experience*: «The epistemological question about the possibility of experience is the question about the essence of experience... (...) With respect to the problem of time, this means that we are interested in *experiences* of time. That these experiences are themselves fixed in objective time, that they belong in the world of physical things and psychic subjects, and that they have their place, their efficacy, their empirical being, and their origin in this world does not concern us and we know nothing about it».

The word *experience* shares with the terms *expert* and *peril* the same etymological root. In some sense, its meaning suggests the idea of *putting out*, *putting at risk*, knowledge.

*Experience* involves doing something we know in the beginning, but about which we know nothing at the end. We know the operational steps – otherwise it wouldn't be about experience – but we don't know with certainty the result.

Every *experience* is a manifestation of the inner world and of the outside world as a single entity.

Knowing this, Husserl separates, methodology and artificially, interior and exterior – focusing on what happens in the appearances, in the subjective, in what we believe, in the phenomenon.

The understanding of this apparent paradoxical division between interior and exterior – that *doesn't exist* and *exists*, because we think so – makes us to recall again the principle of *autopoiesis*.

Husserl starts from the classic text by St. Augustine and go on building his vision about time: «The representation of

succession comes about only if the earlier sensation does not persist unchanged in consciousness but it modified in an original manner; that is, if it is continuously modified from moment to moment. (...) Duration, succession, changes appear. What is implied in this appearance? In a succession, for example, a 'now' appears and, in union with it, a 'past'. (...) ...the intuition of an extend of time occurs in a now, in one time-point».

Franz Brentano, philosopher who was teacher of Husserl, argued that all consciousness is founded on the *intention* – an idea fully embraced by Husserl to whom any idea about time is nothing but consciousness and, therefore, intention – hence the arrow of time, because the intention is, par excellence, something directional.

Husserl creates a diagram to understand what he explains as the things *sinking* into the past, and warns to a curious paradox: «At this point we are seemingly led to an antinomy: the object, in sinking back, constantly changes its place in time; and yet in sinking back it is supposed to preserve its place in

time. In truth, the object of the primary memory, which is being pushed back continuously, does not change its place in time at all, but only its distance from the actually present now. And this is the case because the actually present now is taken to be an ever new objective time-point, while the past temporal moment remains what it is».

Husserl's analysis is curiously visual, dividing and classifying each element into phases, streams and several times closed departments.

In this wave of divisions and classifications Husserl unveils a curious moment: imagining a sound that continues – still after St. Augustine – he comments that «even if the tone continue so utterly unchanged that not the least alteration is apparent to us, hence even if each new now possesses precisely the same apprehension-content with respect to moments of quality, intensity etc., and carries precisely the same apprehension – even if all of this is the case, an original difference nevertheless presents itself, a difference that belongs to a new dimension.



And this difference is a continuous one».

Husserl points to an intimate change, inside each one of us – a change that is always happening, independently of our desire, as a structural part of our beings.

But, even so, how can a difference be continuous? Even if, as Husserl argues, the new, the now already is past and therefore also part of a continuum, or that our subjective changes are, possibly, subject to a biological process of permanent change, a difference can be part of a continuum but it can not be in itself a continuum!

For Husserl, «each actually present now creates a new time-point, which is held fast in the flow of modification as one and the same individual object-point».

In a very interesting way, Husserl details this process: «Every perceived time is a past that terminates in the present. And the present is a limit». It is a truly poetic view – everything

we perceive as time is nothing more than the past determined by the limit that is the present.

Husserl's approach is overtly visual. In one of his texts of 1893 he declares that «to perceive a temporal flow means to perceive a present existent A together with a just past B objectively connected with A and a C belonging to the further past etc.; it means to perceive A and, in the process of being pushed back, to experience B as next past, and so on»; and also that «I perceive a measure, a melody. I perceive it step by step, tone by tone». But, in fact, we never perceived in this way. Only a person with a strong visual mental structure could imagine something similar!

Very interestingly, still in that text of 1893, Husserl approaches Charles Sanders Peirce when he says that «every now turns into its past, since there follows on the perceiving of the now a new perceiving of the now of different form, and the earlier now is then no longer the culminating point. The past act of perceiving is thereby transformed into an inadequate

act, (then) into a merely pictorial act, and finally into something indeterminately symbolic». If we eliminate adjectives, such statement could also say that the past act while sign is *made* into an index, an icon and a symbol.

In a text of 1905, this similarity is even greater when Husserl defines three types of phases in time: «1. Momentary intuition or intuitional phase: the phases of the intuition of the temporal object. The intuition is itself a temporal object and as such has its phases. Take the perception of a melody, for example: perception of the first tone, perception of the first two tones in succession as the first concrete part of the melody, perception of the first melodic pause etc. 2. The moment of the object, the temporal phase of the object: Within each phase in the preceding sense – hence, if we extract a point from the extension of the intuition, within this point – there ‘appears’ a certain temporal formation, the respective concrete part of the melody; and this has its phases. These are appearing phases, not phases of the appearances – of the intuition as experience. 3. The objective phases in 2., which are intended simultaneously

in one moment inasmuch as the unity of apprehension in this moment embraces them all, appear in their continuous multiplicity precisely in the unity of apprehension; and this unity has a corresponding multiplicity of apprehension-moments». This statement clearly reminds Peirce's basic categories: *icon, index and symbol*.

When we take on the famous Husserl's *Seefelder Manuscripts on Individuation*, written in 1905, we are faced to the statement that «the *time-continuum* is not 'something real'. Time, as time, is nothing that endures or changes; a series of temporal differences is not again in time and includes nothing identical that extends through the series – the universal 'time' is something different. But everything that extends throughout time is real; the *temporal content* that fills time 'continuously' is *real*. *The identical is the real*. (...) ...in the *continuity* of change we 'confirm' identity».

In 1927, when Husserl was sixty-eight years old, Henri Bergson launched in Paris his book *Essai sur les Données*

*Immédiates de la Conscience*. In it, the question of time was essential and Bergson stated that, in fact, any kind of succession in time could exist, because while order any succession implies some kind of simultaneity. To Bergson, duration is pure heterogeneity. Even when he uses the term *succession*, it is in the sense of *successions of co-incidences*.

But, beyond all this, Bergson defines – as if he rescued, in some way, the ancient Sumerian concepts of *deep time* and *human time* – two types of time: «There are indeed two possible conceptions of duration, one that is pure of any mixture, and another where the idea of space furtively intervene. The totally pure duration is the form that takes succession of our states of consciousness when our Ego is allowed to live, when he refrains from establishing a separation between this state and the former states» – which would be, for Charles Sanders Peirce, the icon, the relation of quality with its object.

On the other hand, according to Bergson, we also take time as result of contamination by space. Thus, familiarized

with the idea of space, «even obsessed by it, we introduce it with our ignorance in our representation of pure succession; juxtaposing our states of consciousness in order to perceive them simultaneously, no one more than another, but each one side by side with the other; in few words, we project time in space, we express duration while extension, and the succession takes for us the form of a continuous line or chain, where the parts touch each one not penetrating themselves. We underline that this last image implies the perception, no longer successive, but simultaneous, of the before and after, and that it will be contradictory to suppose a succession, which was nothing more than succession, and that tends to just one and single moment».

Genial.

And Bergson continues: «The idea of a reversible series in duration, or just simply in a certain order of succession in time, implies itself the representation of space...» – explaining, even indirectly, the origin of McTaggart's ideas.

In his famous book *Phénoménologie de la Perception*, published in 1945, the last year of the Second World War and less than twenty years distant from Bergson's book, Maurice Merleau-Ponty would give his vision, always poetic and brilliant about the question of time – a vision that would pass, like himself as a philosopher, inexplicably little noticed by the other philosophers of his time.

Unlike the case of Husserl, who dealt with phenomenology taking the interior of the individual as something relatively separated from the exterior, for Merleau-Ponty the phenomenon – as it was also understood by Peirce – is on the whole, on the interaction, on the process, designing an approach that there is no more a clear separation between inside and outside, as if he foreshadowed the concept of *real time*, which would arise around fifty years later with cyberspace.

For him «there is more truth in the mythical personification of time than in the notion of time considered, in the scientific

way, as a variable of Nature in itself, in the Kantian way, as a form ideally separable from its matter».

And Merleau-Ponty continues: «There is a temporal style of the world and the time remains the same because the past is an ancient future and a recent present, the present is a near past and a recent future, the future is, finally, a present and even a past to be realized, that is to say that given each dimension of time be treated or referred to *as* another thing beyond itself, given that there is a sight in the heart of time, or, as Heidegger says, an *augenlik*, *anyone* for whom the word *how* can make a sense».

*Augenlik* means wink.

And citing Husserl's *On the Phenomenology of the Consciousness of Internal Time*, Merleau-Ponty tells us that we have to admit «a consciousness that doesn't have behind of it any other conscious to be conscious of it».



Merleau-Ponty gives us wonderful insights about the nature of time: «the ‘synthesis’ of time is a synthesis of transition», «the feeling of eternity is hypocritical, eternity is nourished by time», «what for me is past or future, is present in the world»; or still «the present is the zone where the being and the consciousness coincide».

He doesn’t believe in memory as a repository of the past, but yes as an «intuitive realization of ‘inventions’ of the conscience».

As for Husserl, also for Merleau-Ponty time is nothing but a form of consciousness.

It is fascinating to reflect on what the notion of time will be in a deeply post-visual and trans-sensorial society.

No less interesting is to remind again the association between life and arrow, in the Sumerian word *tī*.

A more careful reflection about the metamorphosis of the nature of the concept of time along the civilizatory mutations inevitably leads once again to the ancient Mesopotamia.

Norbert Elias shows how among pre literary, heavily acoustic people, a clear division between *past*, *present* and *future* as well as a clear difference between animate and inanimate things do not exist yet.

«The fact that many names of inanimate objects now carry a mark of the male, and other ones the mark of female is certainly a vestige of old state of things when these objects were perceived as people. Would this mean that members of the societies of the past took as alive or ‘animated’ what we take as inanimate?» – Elias continues his thoughts in order to understand the extension of the sense of *animism*.

What a pre literary considers *animated* is not just a rock, an object or a symbol – but a reality.

This was the deeper meaning of life.

In 1978, for example, the Brazilian anthropologist Manuela Carneiro da Cunha made a very interesting work together the Indians Kraho – published in the book *The Dead and the Others* – in order to understand what is death for that society. Her text makes clear that for the people Kraho *animism* is part of reality, which is beyond the objects, always present in rites, myths and beliefs.

By analyzing Sumerians or Egyptians myths and tales, we realize the same condition.

Claude Lévi-Strauss classified mythological time in two main categories: synchronic and diachronic – according to Saussure's principles of semiology. In fact, however, the phenomenon of time seems to be closer to Charles Sanders Peirce than to the verbal universe of Ferdinand de Saussure.

## THREE

*lu nun cuntu metta tempo (in a story time has no time)*

*old Sicilian proverb, Italy*

*Ti* indicates the ideas of *life* and of *arrow*, in the sense of an animated reality where time is its essential condition, where everything is dissipation, and where the diagram *past, present and future* is not yet crystallized.

Life and time asymmetry; order and entropy; concentration and dissipation; attraction and repulsion; container and process; present, past and future or before and after; all that involves time as possible concrete existence, seems always be bundled

in the number *two*, even being a quality and, then, not allowing explanation.

The Mesopotamian civilization itself arose from the number *two* after the symbiotic fusion between two totally different societies, different roots: the Sumerians and the Akkadians, in a relationship that last around one thousand years.

It was not the domination of one people by another that meant the birth of what we commonly call *civilization*, which was born in the ancient Mesopotamia, but yes a deeply symbiotic relationship.

A clue to understand the idea of *time* among the ancient Sumerians, is the concept of *deep time*, present in the *Enuma Elish*, poem of creation.

The older version that arrived to us is dated of probably about one thousand and three hundred years before the

Christian era, and it is related to a much older past, surely Sumerian.

In the poem, the human being appears only after the creation of time. And the time dips deeply into the past, forming a kind of profound and enigmatic cosmic complex present in all things – this is the principle that became known as *deep time*.

In fact, the modern concept of *deep time* would only be established in the eleventh century by the great Persian mathematician and philosopher Ibn Sina, also known as Avicenna, who lived between 973 and 1037.

Avicenna identified the *deep time*, while an essential element in the formation of all things, with geological time – present in everything that surrounds us.

In the Sumerian poem, the idea of *deep time* is not just geological. He is present in all things.

Thus, the *Enuma Elish*, in its fifth tablet, following the translation of the British archaeologist Leonard William King, of 1902, shows the time as an entity that is anterior and structural of all things:

*He (Marduk) made the stations for the great gods;  
The stars, their images, as the stars of the Zodiac, he fixed.  
He ordained the year and into sections he divided it;  
For the twelve months he fixed three stars.  
After he had ... the days of the year... images,  
He founded the station of Nibir [the planet Jupiter] to determine their  
bounds;  
That none might err or go astray,  
He set the station of Bel and Ea along with him.  
He opened great gates on both sides,  
He made strong the bolt on the left and on the right.  
In the midst thereof he fixed the zenith;  
The Moon-god he caused to shine forth, the night he entrusted to him.  
He appointed him, a being of the night, to determine the days...*

Interestingly, Marduk was a solar god, that is, linked to vision – even if the Mesopotamian culture wasn't yet enough

visual to unchain strongly abstract concepts like what would happen in Greece.

Even so, time was celebrated, especially at each New Year.

In Mesopotamia, some five thousand years ago, at the end of each year a big party happened to celebrate the New Year – like what it is done until now, after thousands of years. The feast lasted for twelve days. It was believed that in those twelve days of celebrations *time* would be reorganizing and renewing itself for the coming period. Thus, it was an especially important festival, because the quality of the following years depended on how time had been successfully reorganized and renewed.

At the party, orgies were made, there was a cult to the atonement and, like what would happen in Rome thousands of years later during the famous *Saturnalias*, the social order stopped to exist. Aristocrats and people, for twelve days, passed



to be equal during that period when time was reorganizing itself.

In those days in which *time* ceased to exist, to reorganize itself for a new year, everything was canceled – because the order of the world could only exist with *time*.

The twelve days of absence of order also had a very objective effect for anyone who was in power. During the festivities, authorities watched people's behavior, now free, and persecuted those who exceeded too much, because during the year they could be. in some way, a source of danger.

Although the *carnival* had emerged as a religious festival with the creation of *Holy Week* by the Catholic Church in the eleventh century, the festivities of New Year in Sumer certainly were among its most distant roots.

Julius Caesar established the celebration of the New Year on the first of January in 46 BC.

Interestingly, in three days of the Brazilian carnival – which became the world’s most famous in the twentieth century – all activities are suspended as well as the entire social order, as if time had stopped to reorganize itself, to renew itself. Also there, the excesses – even if forgiven – often mark the person during the following year. Business and commitments are usually transferred for the period “after the carnival”.

The last four days of the Sumerian festival were dedicated to the celebration of Marduk’s death and resurrection.

There, the sense of *guilt* launches its roots, in the rituals of atonement, which would be projected through many different religions and sects in the West.

The sense of *guilt* already is the recognition of a relatively visual time – it is about the direct reference to something that was done before and that projects the *consequences* in the future.

What will become clear in the magnificent epic *Gilgamesh*.

It is believed that Gilgamesh was an historical figure, initially called *Bilgames*. It is said that he was buried in the bed of a river – and to be possible that, Euphrates have possibly been deviated. In 2003 a team of German archaeologists announced the discovery of the place where Gilgamesh would be buried. He would have lived around 2700 BC – and the myth surrounding his name certainly can be launched to a Sumerian past.

In the epic, Enkidu, the best friend of Gilgamesh, died. From that moment the hero started dedicating his life to the conquest of immortality.

For Heidegger, the ultimate meaning of time is in the death.

When Gilgamesh is near the end of his journey, asks Uta-napishti – king and religious leader of Shurrupak – how he could gain eternal life. Uta-napishti tells how he survived the flood and how he received the eternal life, becoming a god, in recognition of his behavior. He suggests Gilgamesh to not sleep for a period of seven days, after which he would receive immortality.

But desperate, Gilgamesh realizes that he is not capable to do that. Suddenly, he has the consciousness of his human condition and of time.

This notion of transcendence of the human to the divine through the overcoming of time – in a kind of *perpetual future* – requires a degree of abstraction that allows foresee what would come with Greece and Rome a few thousand years later.

Even if to Heidegger the ultimate meaning of time was the discovery of death, he also wrote that «the essential phenomenon of time is the future. To understand it without

putting it as an interesting paradox, the perpetual *daisen* – *being-there* – should remain in its anticipation».

All this means that, although relatively distant, the seeds of Western thought, of *History*, of *isonomy*, are already present in the world of ancient Mesopotamia and ancient Egypt.

The period of New-Year celebrations in the Sumerian world was a temporary cancellation of the entire culture – and the sense of time is nothing more than a construction and, therefore, a cultural element par excellence. Thus, when it is canceled, time emerges as a fact of consciousness, because only difference produces consciousness.

The Mesopotamian time that reorganizes itself is the *deep time*, which is in all things, sprout out everywhere, the essence of life.

Such concept of *deep time* present in the *Enuma Elish* – events happened in a mysterious and unfathomable past, but

that is beyond any possible diachrony and present in everything – would suffer a revolution in the Egyptian universe.

In the ancient Egypt two words described the idea of *time*: *neheh* and *djet*. The first indicated time in the human scale, what will be, what we constitute as knowledge; and the second, what has already passed, that is unchangeable, it was the *deep time* of the gods, something that could be roughly interpreted as *eternity*.

As if the present, made with the realization of the future, would plunge into the eternity of past – reminding us Husserl's diagram.

Both hieroglyphics *neheh* and *djet* have the figure of the snake.

In *neheh* – time in human scale – Nile is present as an essential function, bringing the cycle of floods and droughts.

Despite to clearly have the figure of the snake, the two hieroglyphs don't show directly *Ouroboros*, the snake eating its own tail. But it is inevitable to not think on such figure that is understood as the ultimate symbol of eternity.

The figure of *Ouroboros* would have emerged in Egypt in about 1600 BC.

Its reference, albeit indirectly, reminds us the concept of cyclical time, so important to the Egyptian world.

Thus, it was established in Egypt a division between a cosmic, deep, full and *acausal* time, and a human, chronological and causal time.

Some people believe that there was not, in ancient Egypt, a word for the abstract concept of *time*, because the ancient Egyptians did not organize time as *past, present and future*.

In fact, the technology to establish time as a continuous

line of development, characterized by a present running on a line of *past and future* would only be constituted by the intensification of the use of the phonetic alphabet.

But even if time were only considered as *before and after* – and the words and *djet* and *neneh* would respectively designate the *deep time that already happened* and the *time of action* – one cannot ignore a conception of time oriented to *before and after*, as it happens until today in illiterate cultures.

Until the period of Amarna, before called Akhetaten – fabulous city founded by Akhenaten, who lived around 1350 BC – the Egyptians divided the period of the day in three temporal moments, all them directly related to the Sun: in the morning the sun was known as *Chepre*, ‘who is born’; in the middle of the day it was *Re*, which meant ‘one who changes in himself’; and at the end of the day it was *Atum* – ‘completion’, god half human and half snake. It was not yet a structure of *beginning, middle and end; past, present and future* – but rather, *now and then*.



Even so, the division of day into *Chepre*, *Re* and *Atum* already seems to indicate the future division into *past*, *present* and *future* that would emerge in ancient Greece.

For the German Egyptologist Jan Assmann, «continuity is a dramatic concept of time, and it calls human being to action. *Djet* and *neheh* must be continuously unified, in order to keep time going, and to guarantee continuity».

That is, in ancient Egypt there was not a homogenous line of causal chains with a *past*, a *present* and a *future*, with the present running on it. At each moment, everything was involved by *the before* and *the after*, which was repeated every day.

As Achtner, Kunz and Walter underline: «in Egypt no calendar was established in the manner of marking on a straight line or linear time».

In that universe of qualities, night was a serious threat for *time* – which was designed by the Sun. It was a dangerous moment – even because we have no sense of time during our dreams.

That triadic approach to time as solar expression in the ancient Egypt would change with the reign of Akhenaten, who introduced more than a religious revolution, a transformation in the approach to life and the world. Akhenaten responded to the disruption of a technological frontier that Egyptian society had done and which would suffer, as always happens, a strong reaction from the ruling class of the day.

Interestingly, Akhenaten's revolution conferred to the Sun the position of the only god.

After the revolution of Akhenaten, we have a first emergence of what would come to be what we call *History* as civilizatory technology. That is, for the first time we have a universe with enough visual intensification to project the idea

of *past, present and future*.

A stele of the Eighteenth Egyptian Dynasty, dating from around 1300 BC, tells us:

*I was clever for the future,  
I learned from yesterday.*

This logical principle would be the generator of *History*, inaugurated by the hands of Herodotus, who lived between about 485 and 420 BC, nearly a thousand years later.

The Sumerian ideas of *deep time* and of *human time*, as *neheh* and *djet* in Egypt, surely were the foundation of Anaximander's thought, with the elaboration of the cosmic structure *apeiron* and *peras*.

But such duality launched a thousand years of depth between Tigres and Euphrates coined more than Anaximander's cosmic ideas.

The division of time into two essential elements in both Egyptian and Mesopotamian cultures seems to have passed almost directly to the Greek world, where the idea of *time* was designed as *chronos* and *kairos*.

While *chronos* indicated what we call chronological time, *kairos* designated the *right time* for something to happen and was therefore linked to a higher order, to a cosmic principle.

The idea of *kairos* reminds us that of *dharma*, something that belongs to a transcendental order like, in some sense, the Sumerian *deep time*.

Plato discussed the nature of time in *Timaeus* revealing much of the ideas of the Greek world of his day – indicating a remarkable influence received from the Egyptian universe: «When the Father who begat the world saw the image which he had made of the eternal gods moving and living, he rejoiced; and in his joy resolved, since the archetype was eternal, to make

the creature eternal as far as this was possible. Wherefore he made an image of eternity which is time, having an uniform motion according to number, parted into months and days and years, and also having greater divisions of past, present, and future. These all apply to becoming in time, and have no meaning in relation to the eternal nature, which ever is and never was or will be; for the unchangeable is never older or younger, and when we say that he 'was' or 'will be', we are mistaken, for these words are applicable only to becoming, and not to true being; and equally wrong are we in saying that what has become *is* become and that what becomes *is* becoming, and that the non-existent *is* non-existent... These are the forms of time which imitate eternity and move in a circle measured by number».

With the emergence of the Greek world, the ideal human being becomes the first universal creation, reversing the ancient Mesopotamian and Egyptian traditions.

It is in this Greek universe, in about 580 BC – nearly two

hundred years before Plato – who, with the ideas of *apeiron* and *peras*, Anaximander would project the design of the solar quadrant a graphical representation of sky dome, which would be directly recalled in the design of mechanical clocks dials almost two thousand years later.

Plato argued that time was the *moving image of an unmovable eternity* – as if he was making a reference to the Sumerian concepts of *deep time* and *human time*, and to the Egyptian ideas of *neheh* and *djet*.

Everything obeying to the designs of the *number*. But always having the past and the future as pure illusions.

To Plato, the only real time is the *present* – and since the *present* is intangible, it must obligatorily mean a direct relation with the eternal.

Then, time will be what exists not existing and that, therefore, like the ratio of the circle to the Egyptians, is the

manifestation of total existence.

In a certain sense, the great Meister Eckhart would launch himself to Plato, many centuries later, already at the end of the Middle Ages, when he stated that «one day, six or seven days ago, or more than six thousand years ago, is so near to the present like yesterday. Why? Because any time is contained in the *present Now-moment*».

In another moment, Eckhart said that «'here' and 'now' mean time and place. 'Now', which at the very least is time, is neither a piece of time, nor a share of time; probably however it is a taste of time; it is a mountaintop of time and an end of time. Still, as small as it may be, it must depart; everything that touches time of has a taste of time must depart».

Also in *Timaeus*, Plato declared that «everything that becomes or that is created is the result of a cause... (...) The world is something created or without creation? – this is the first question. It is created, I reply, because as it is visible,

tangible and having a body it is, therefore, sensitive; and if it is sensitive, then it is something created; and if it is created, it is the result of a cause, and the cause is the ineffable father of all things, which had before it an eternal archetype».

Sometimes, it is considered as true an oxymoric and flagrant opposition between Plato and his student Aristotle, as if they were two worlds totally different.

But we find in Plato the roots of the general principles of causality that would be inevitably unchained in the local causality and the *excluded middle* principles of Aristotle.

Plato tells us that *movable image of the unmovable eternity* is founded on the principle of causality and on the *number*, but when we ask ourselves about what nature of number we find in *Timaeus* – if *number quality*, strongly Pythagorean, or *number quantity*, with which we turn ourselves to Aristotle – we don't have an immediate response.



Either it could be the *number quality*, as it could be an anticipation of the *number quantity*, typical in Aristotle's thought.

In Plato, we can count the time spent and record it, as if it was a *number quantity*. However, the fact that it is the number while an expression of eternity, immediately puts us face to Pythagoras and the *number quality*.

More than two thousand years later, what for Plato was a kind of movable representation of the unmovable eternal, a representation obeying to the *number quality*, would be covertly criticized by Heidegger, when he claimed that only we can know the time from the condition of our finitude, while discrete domains, from the death and not from eternity, to which we do not belong.

That was Heidegger's argument: time established from the death, from our limit and, then, through the emergence of fear of the end that would designate the widespread human

fascination for time.

In fact, Heidegger doesn't fail to establish the time while the quality of *daisen*, of *being-there*, but while *number* this idea would belong to what is designated by the boundary, by the border.

On the other hand, Michel Serres would announce a different approach about the existence and the concept of time. To him, it is the object – and not death – the essential question of time.

To Serres it is not the end that determines the existence of time, but yes another existence, that of the object: «The only significant difference between animal societies and ours is in the emergence of the object. (...) In fact, the object, specifically made by the human being, stabilizes our relations; it slows the time of our revolutions. For a group of baboons, social changes burn each every minute. (...) The object, for us, turns slow our history».

If we observe at animal behavior, yet remaining elements of social relationship, fragments of short-term memory seem to be quickly lost.

Thus, what seems to produce the notion of time is, in fact, a specialized design of condensation of short-term episodes into long-term memory.

However, here the key issue is not to understand what time *really* is, but to understand something about how the concept of time transformed itself over the centuries.

Pupil of Plato, Aristotle summarized in his *Poetics* the fundamental ideas of *tragedy* and the principles of composition through two key concepts: *mimesis* and *muthos*.

Through his reflections on the method of poetic composition key elements emerge about what he regarded as time.

To him, *mimesis* was established while an «imitation of Nature», to which many centuries later St. Thomas Aquinas would add *in its modus operandi*. «Epic poetry and tragedy, as well as comedy, poetry and music for flute or music for lyre, are all them, taken as a whole, forms of imitation. But at the same time, they differ in three ways, either by the difference in type of their media, the differences between their contents, or in the form of its imitations. (...) The contents an imitator represents are actions».

On the other hand, over the centuries, the Greek word *muthos* finished being eventually translated in different ways by different translators and philosophers. J. Hardy translated it as *fable*. Paul Ricoeur gave to it the meaning of *intrigue*. Dupont-Roc and Lallot preferred to translate it as *history*.

Here, I assume Dupont-Roc's and Lallot's translation, taking it as *history*. Paul Ricoeur justifies his choice with the argument that no two words in French describe what in English

is defined as *history* or *story*, and that the Portuguese of Brazil is *história* or *estória*.

In any case, *history* and *story* are structurally linked concepts.

The concept of *history* is too overwhelming while civilizational technology to be put aside. It is not specifically about the *content* of a history, but about the fundamental structure of it: system formed by particles of a causal nature established in a strongly hypotactic organization, projecting a simplified profile of events that aspire to truth, to total signification.

Appeared in 1647 from the French *intriguer*, which means *to trap*, which was born from the Italian *intrigare* that, in its turn, emerged from the fusion of the Latin particles *in* and *tricae*, meaning *inside a perplexity*, the word *intrigue*, in its etymological meaning, is closest to the sense indicated by the English expression *plot*.

But *history* is not exactly that, it's not exactly to be *inside a perplexity* – because perplexity, often, is in what is excluded from it – neither is *to trap*, *to conjure*.

History is a powerful causal interpolation of possible facts, constituting a specialized profile of alleged events.

When Aristotle indicates *mimesis* and *muthos* as essential elements of a composition, he establishes two essential dissipative principles.

*Imitation* can only happen while dissipation and *history* establishes its essential principle of order also in dissipation.

That is, it is no longer about an imitation through associations of similarity, like it happened in the ancient Egypt, but yes through relations of contiguity.

With such statement, we have not only the description of the ideal process of fiction composition, but also an image

of the idea of time, of the mind organization, to which Aristotle belonged. It was an organization already strongly predicative, which an essentially teleological nature.

History and imitation imply, inevitably, diachrony and predication.

Faced with the question “What is a poet?”, Aristotle answered: *a maker of stories – poiètès muthôn ton*. That is, a creator of teleological complexes. Who was not able to do it, could not be a poet, because would be out of the order of his time.

Thus, for Aristotle, time is *counted* in tragedy, like *quantity numbers* – now without room for any kind of doubt about its nature – everything having a principle, middle and end: everything established between *arkhe* and *telos* – beginning and end.

Everything structured inside a strongly predicative

universe, of a nature frankly teleological: «A verb is a composite significant sound involving the idea of time, whose parts have no meaning by themselves. While the words ‘man’ or ‘white’ do not imply ‘when’, the expressions ‘walk’ and ‘walked’ involve, beyond the idea of to walk, that of the present time or of the past time».

With Aristotle, the verb is what structures the nature of time.

The seventeenth century would take the concepts established in Aristotle’s *Poetics* as fundamental to define the three basic units of classical tragedy: place, action and time. Units that would be firmly rejected during the following two centuries, in defense of utopian ideals back to Nature and to the conquest Freedom.

In his *Categories*, Aristotle stated that «number and word are discrete quantities; lines, surfaces and solids are continuous quantities, and beyond these, so are time and space. (...) Space



and time belong to this class of quantities. Past, present and future time form a continuous whole. Likewise, space is a continuum, because the parts of a solid occupy a certain space and have common boundaries; it follows that the parts of the space, occupied by parts of the solid, also have common boundaries, such as parts of the solid. Thus, not only time but also space, both are continuous quantities, because their parts have a common boundary. Quantities consist either of parts that share a relative position between themselves or by parts that do not share».

Thus, for Aristotle time was a continuous entity formed by discrete particles – which would be, in a sense, recalled by the Roman emperor Marcus Aurelius when, about five hundred years later, he claim that «time is a river made of events...».

In some way following Plato's footsteps – which brings us to the ancient Sumerian idea of *deep time*, as shown in the *Enuma Elish*, and to the Egyptian concepts of *neheh* and *djet* – Aristotle argued that time, while continuous fabric, is generated

by the movement of celestial spheres.

The big difference here is that with Aristotle the human time is no longer an autonomous and independent concept; it became relative, relational – because, being generated by the sidereal spheres, it is relative to them. If they would suddenly stop, time would also stop.

To Aristotle, time is a concrete entity, product of movement, result of relations – in whatever its scale. On the celestial scale, like the ancient idea of *deep time*, it is the result of movements of the spheres; on a human scale, it is the result of the changes of things.

In this way, being product of relations, time can be measured, because it can be compared with other things.

As Heidegger alerted in his text *Der Begriff der Zeit*, a clock is nothing more than a mechanism that always repeats the same sequence of temporal events. It is the comparison with

those cyclical events that produces the idea of a determined measuring of time.

And that is why the mechanical clock appeared only in the late Middle Ages, not before. Its existence requires a deeper degree of visualization, because it is about a system of repeating sequences of events – and as Bergson said, they strongly spatial.

Thus, Marshall McLuhan said that «for the mechanical clock dominate it is necessary to accept in advance the pressure inherent in the visual phonetic literacy».

The invention of the mechanical clock is, in fact, the invention of the *escapement* – a device that allows fragmenting a flow of movement into uniform units, as if somehow the flux of time became divided into fragments – like the seconds, minutes or their fractions.

The first known reference about a type of *escapement*

for clocks, even though in this case it is about clepsydras, was made by Philo of Byzantium, a scholar on mechanics – also known as Philo Mechanicus – who lived from about 280 BC and 220 BC, through his Treatise *Pneumatics*. It was an epoch when the Greco Roman world was relatively oriented to the visual universe through the intensive use of the phonetic alphabet and the papyrus.

On the elaboration of the escapement for clepsydras, Philo of Byzantium probably followed the footsteps of Ctesibius of Alexandria, another famous scholar of mechanics, his contemporary, who lived between 288 and 222 BC. Philo arrived to visit Ctesibius in Alexandria, especially to study clepsydras.

It is believed that Ctesibius was the first director of the famous Library of Alexandria, and lived comfortably together the court. Philo was a great admirer of him.

But the invention of Philo of Byzantium, or of Ctebisius, still depended on the flow of water and cannot be considered

as a true mechanic escapement, which exclusively works with weight.

It is considered that Villard de Honnecourt, architect and artist who lived in the thirteenth century, as the responsible for the invention of the first escapement and, in this way, also of the essential foundation of the mechanical clock.

Later, Leonardo da Vinci designed a celebrated project of clock with escapement.

The invention of the escapement was, in logical terms, what had already happened, in some sense, with the invention of the phonetic alphabet, more than a thousand years earlier, fragmenting and departmentalizing the phonemes into discrete visual elements.

And that's what happened with Gutenberg's movable metal type press, with the movie and even with the binary digital systems – all born of the same process, from the same

root.

In a certain sense, the mechanical clock made the personal time become eternal. When we look at a dial, we see the position we are in the day, like a spatial phenomenon, as if the day was an entity with concrete existence, and thus, in a sense, eternal.

This happens because the idea of *eternity* is only possible as consequence of the subdivision of time.

## TWO

*The existence of antimatter, already demonstrated in our days, is the material proof – or, more accurately, anti-material proof – of the fact that time exists, that it has an only direction ordering the events according to what is required by the principle of causality*

*Etienne Klein*

To Henri Bergson, in his classic *Essai sur les Données Immédiates de la Conscience*, of 1927, the homogeneity we find in certain conceptions of time – like what happened with Aristotle – reveals a profound contamination of the concept of space. «There are, indeed, two possible conceptions of duration, one of them pure of any mixture, and the other where the idea of space surreptitiously intervenes. The totally pure

duration is the form that takes the succession of our states of consciousness when our I lives, when he refrains himself from establishing a separation between the present state and the previous ones», but in the other type of duration, continues Bergson, «we juxtapose our states of consciousness to perceive them simultaneously, no more one in the other, but one aside the other; we project the time in the space, we express the duration as an extension, and the succession takes for us the form of a continuous line or a chain, where the parts touch however not penetrating each other. Lets us to underline that this last image implies the perception, no longer successive, but simultaneous with the before and the after...».

Still submersed into a highly visual medium, Plotinus – who lived between 204 and 270 – said: «Movement must be distinct from the medium in which it takes place. And, with all that has been said or is still said, one consideration is decisive: Movement can come to rest, can be intermittent; Time is continuous. (...) Time, however, is not to be conceived as outside of Soul; Eternity is not outside of the Authentic Existent: nor is



to be taken as a sequence or succession to Soul, any more than Eternity is to the Divine. It is a thing seem upon Soul, inherent, coeval to it, as Eternity to the Intellectual Realm».

Nearly seven hundred years after Aristotle, Augustine of Hippo – who lived between 354 and 430, one hundred and fifty years after Plotinus – would question in his famous *Confessions*: *what is time?*

His text would be the one that, about time, would generate the most powerful impact over the centuries.

In his attentive reflections, Augustine worked a universe with strong psychological character – always looking to put the human experience as the basis of his questioning.

Thus, incorporating Aristotle's principle of the *excluded middle*, Saint Augustine wondered about the possibility of the existence of time: if the future doesn't exist yet, if the past no longer exists and the present, when accomplished already is

past, time simply could not exist.

How could the time be a concrete reality? Firstly, only the future and the past are subject to measurement. It is impossible to measure the present moment: «If we conceive an element of time that cannot be divided into parcels of instants, not matter how small they can be, to that we call *present* (...) and the *present* has no space».

With this observation, St. Augustine anticipated in a thousand and five hundred years some elements that would constitute the principle of relativity, according to which time and space are vectors of a same phenomenon.

To Augustine, there is no time without space, although for him, paradoxically, they are two non-existences, two illusions – in certain sense as it was for Plato.

Time and space only happen in the past. Even when thinking about the future, it is already past when we imagine it

or even when we imagine its mere possibility.

«Even so, Lord» – Augustine continues – «we perceive the intervals of time; we compare them, and we call some of them longer, shorter other ones. Still, we measure how much some are shorter than others».

It is worth noting that Augustine always uses the terms *future* and *past* – *futura et praeterita* – while adjectives and not while substantives. As if they were qualities of a single time, participants in a present, transient, volatile and – in fact – nonexistent time.

«If past really exists, where is it?» – he questions, without hiding his perplexity.

When Augustine asks *where is time?*, there is a larger underlying question: could something exist without place? According to Aristotle, everything that exists needs, obligatorily, a place.

Wouldn't be this question what Henri Bergson pointed as the contamination of time by the space? Wouldn't be it the clear indication of a specific type of time, more visual, which would quickly disappear at Augustine's epoch?

Even if we consider the past as memory, we must have in mind that memory is nothing more than permanent construction and that construction is an action that happens in the present.

Thus, even considering time as memory, it will always be present, in permanent reconstruction.

Aristotle argued that time is the result of movement, and that time could exist, it should be the product of the movement of celestial spheres.

Augustine opposes himself to Aristotle, citing the Biblical description of Joshua paralyzing the movement of the Sun.

Thus, according to the biblical text, the movement could be stopped, but not the time, which, therefore, would be somewhat independent from the movement.

Both Aristotle and Augustine didn't speak in terms of perception and cognition, although their conclusions – in one or other way – have there their roots.

That remark by St. Augustine reveals his conception of time as a kind of supernatural entity, that is, something *beyond the movement*.

So what would be time for Augustine? He gives us the answer: «...it seems me that time is nothing more than distension...». And it is in this simple statement that his great thesis on time is placed, which would be projected through the centuries.

To Augustine, time is a condition of *passage* – idea that would have strongly influenced Heidegger in his conception of

*daisen*, of *being-there*, of the Being while action and not while substance.

«Let's to measure a sound when it happens. (...) As soon as it ceases to sound, it will already be past and will no longer be anything that can be measured». Even so, Augustine continues, «there are not the things in themselves what I measure, which no longer exist, but something that is in my memory...». It is when the idea of the *triple present* emerges: past, present and future as elements of the *now*.

The past in the present emerges while *vestigium*.

To St. Augustine, «the present intention makes the future to happen in the past, making us believe in the past through a decrease of the future, to what that, by seizing the future, everything has become past».

For this transition to happen, Augustine determines three conditions of the spirit: expectation, attention and memory.

Therefore, «what is expected, crossing what is attention, pass to what is remembered».

Centuries later, the three essential conditions of St. Augustine's *triple present* would be designed in the three categories of the General Theory of Signs by the great American thinker Charles Sanders Peirce.

Each one of those conditions would be a *tension*, and the result of its fusion in the projection of time would be a *distension*.

Thus, there is an opposition between what forms time and the time itself, an impossible aspiration, indicating its condition of concrete existence – exactly as it happens with Peirce's concept of *sign*.

«I prepare myself to sing a song I know» – Augustine writes, in one of the most beautiful moments of the Book XI of his *Confessions* – «Before I start, my expectation is tensed in

the sense of the whole of that song; but as soon as I started, as the elements took out from my attention become the past, my memory is tensed in their direction; and the alive forces of my activity are distended in the sense of memory depending on what I said, and on the sense of the causes of what I'll say. In any case, my attention is there, present, and it is through it that what was future transits to become past. More this action is moving forward, more the expectation is shortened and more memory is extended, until all the expectation is exhausted, when all action is over and passed to memory».

The expectation and the memory are in *tension*, while the *tension* of attention happens in the transition from the future to the past.

«...the alive forces of my activity are distended in the sense of my memory in function of what I said and in the sense of the expectation in function of what I will say...» – he continues – «...it is the present intention that makes the past the future to the past». There only is *distension* in *tension*.



When St. Augustine uses the term *intention*, he incorporates the whole Aristotelian logic universe but also denies it, in part, when, for example, he argues that time cannot be paralyzed.

Even so, *tension* and *distension* are essential characteristics of local causality. And, because of it, there is a strong relation between *eternity* and *time* to St. Augustine. To him, the Verb is the eternity, which is opposed to the human voice that is simple representation.

The Verb as revelation of the universal structure without time is, in fact, the approach to the world as a strongly predicative and teleological phenomenon – it is its ultimate *vanishing point*. And infinite or eternity cannot exist without a subdivision into hierarchically organized particles.

To Aristotle, the world is an endless causal chain – a principle that, pushed to the limit, would permit Poincaré to

imagine that, once known the very first causes, all others would be immediately revealed, making possible a precise and perfect foresight and anticipation of the future.

In Aristotle's universe, as it is manifest in his *Poetics*, the whole discourse is articulated by the strategies of *history* and *representation*.

The principle of causality, while an *ad infinitum* process, implies the nonexistence of a beginning or of an end – and that is why both Aristotle and St. Augustine argued that the world is eternal.

If a universal causal system would have an origin, it would be a discontinuity of the causality itself, establishing the possibility of ruptures and, therefore, would cease to be purely causal.

But St. Augustine has to admit the miracle which, beyond the dogma, is a discontinuity in time. When doing it, he denies

again Aristotle's thought.

On the other hand, sin and guilt can only exist when there is *free will*. In its turn, any *intention* requires causality. Thus, the concept of *intention* emerges as a denial of *free will*.

There is only one condition for *free will*, and it is *chance*.

Every *intention* implies a memory and a consequence, being, therefore, part of the great tree of causality envisioned by Aristotle.

Without solving the paradox, such conflicting complexity between the causal universe and free will is clearly present in St. Augustine's text, which brings to time a strongly fractal design when he says that «what is produced in the song as a whole takes place in each one of its parts and in each of its syllables; this is produced in a broader action, where certainly the song isn't more than a small part; this occurs throughout the entire life of the human being, when the parts are their actions; this

is produced during the entire series of centuries lived by the humans' children, when the parts are all the human lives».

Interestingly, St. Augustine seems not to deal with this conflict when he writes *The Free Will*.

Our concept of time is closely related to the notions of *causality* and *free will*.

## ONE

*I'm too involved in the future: a trembling of horror took me. And as soon as I looked around me, time was my only contemporary.*

*Friedrich Nietzsche, in Thus Spoke Zarathustra*

St. Augustine's questions crossed centuries, and it would be only more than a thousand years later that the time would revolutionize the world, via Galileo Galilei.

As Etienne Klein says in *Les Tactiques de Chronos*, published in 2004, «until the sixteenth century the common idea of time was focused on everyday concerns, and no one even thought about making time to intervene directly in the expression of a physical law».

Galileo was responsible for this profound and overwhelming revolution.

In fact, Galileo introduced, in a structural way, the question of time as conditioning of the form of the Universe. Until then, everything that was imagined about the conception of Nature was directly related to space.

With Galileo, for the first time, space lost its primacy to time, which becomes basis of the method of researching Nature.

His ideas about time passed to impregnate in a definitive way everything that would follow. It is even impressive to notice how many times he is not mentioned when we deal with time.

Rémy Lestienne underlined the importance of Galileo for the birth of science in its modern sense: «Time, and not space, is the hidden parameter of the dynamics, the real resource

of physics! (...) The invention of time of dynamics allows the founder of the new science to reverse Aristotle's perspective, who took time as the number of the movement. The number of movement only exists in motion, it is subjected to motion, it is only a reflection of that very first reality, and probably it will not exist if not numbered, that is, to be within the human mind, as Aristotle himself suggests in his *Physics*. To Galileo, by contrast, Time is the first. It is it that reigns over the whole reality of the world and regulates, particularly, the movement».

In 1636, Galileo wrote to the General States of the Netherlands proposing the pendulum and the escapement as the official mechanism for measuring and observation of the passage of time – as a way to set a conceptual standard in relation to the idea of time in universal and international terms.

In his *Discourses and Mathematical Demonstrations concerning Two New Sciences*, of 1638, Galileo gives us a remarkable insight about the introduction of time in Western

thought through a beautiful description of the *inclined plane*: «On a ruler, or more accurately a wooden beam with a length of about twelve cubits, with a cubit and a half of width and three fingers thick, lets to carve a small channel with a width of just over one finger, and perfectly straight; after having covered it with a very polished sheet of parchment as to make it the smoothest possible, let a very tough ball of bronze, perfectly round and polished. Then placing the device in an inclined position, raising one of its ends at a cubit or two above the horizon, let the ball run through the channel, noting, according to a procedure I will explain later, the time required to complete the descent; the experience is restarted several times in order to determine the exact length of time, but finding no difference greater than one tenth of a heartbeat taken at the pulse. Having the establishment of this first measure made, we bring the ball down by only one quarter of the channel: the measured time is always exactly equal to half of the previous time. Next, we varied the experiment comparing the time required to complete the entire length of the channel with the time to complete its half, or two thirds, or three quarters, or any other fraction; repeated



these experiences a good hundred times, we will always find that the spaces traversed were between them as the square of the times, and this is found irrespectively to what the inclination of the plane is, that is to say, from the channel where we let the ball go down».

This is the story of the experimental device invented by Galileo called the *inclined plane*.

Until then the time was not involved in what we call *science* and its approach was more contemplative than experimental. The introduction of time in the approach of natural phenomena changed the whole mental structure of the Occident.

Acoustical societies, strongly diachronic, have the perception of space; visual societies, strongly synchronic, have the perception of time.

That's what happened with Galileo – that was the expression par excellence of the intensification of a visual

universe established by the phonetic alphabet and paper through the invention of Gutenberg.

In his *Etudes Galiléennes*, of 1939, Alexander Koyré – philosopher and historian, student of Husserl and David Hilbert – concluded that what Galileo described was, indeed, a product of his mind, because the technology of that epoch would not have allowed reaching the results he presented.

This revelation of Koyré is more than surprising because, according to it, Galileo would have mentally created those experiences, and used time with a precision that would be impossible to obtain with the equipment of the epoch.

But even if, possibly, in immaterial terms, Galileo was a great scientist of the experience.

In this same mental universe, Galileo improved the pendulum and the escapement – which would give to mechanical clocks a precision never achieved before. Discoveries that were

just a translation, in logical terms, of Gutenberg's metal type press, in uniform cycles of repetition.

Only repetition allows us to perceive what we commonly call *time*, with changes, and paradoxically in reality nothing is repeated.

It is the repetition of something strange to the phenomenon what produces its consciousness.

Descartes, who was a contemporary of Galileo, still had an archaic approach to time – for him, God mysteriously prolonged life at every moment, making the time never stop. But his time, even being a divine and ideal manifestation, already was a single and continuous time, like a line always increased by God.

When Galileo died, Pascal was nineteen years old. While Galileo used the concept of time in experimental terms, incorporating it through live experience, through its application

in concrete terms, Blaise Pascal saw time as a primitive concept, that is: a so basic concept that there would not exist a possible definition, or that any definition would be simply useless – such as to define *color* or *heat*, for example.

It would be a so fundamental term or idea that would be naturally clear, it would not need any explanation. More than that, any explanation would be impossible, given to its condition of complete originality. To such essential radical condition of the words, Pascal called *primitive*: «Nothing is more unreliable than the discourse of those who want to define these primitive words. What is the need and what we could explain about what we mean by the word *man*? (...) ...time is like that. Who could define it?».

Already in the late twentieth century, the philosopher and specialist on dance and movement, Maxine Sheets-Johnstone, seemed to recall the principle of Pascal to the understanding not only of movement but also of time: «...for any particular temporality to be the temporality it is... a certain temporal

quality is essential to it: an ongoing evenness as when we walk normally or an ongoing unevenness as when we walk with a limp; a jaggedness as when we move in fits and starts, a swiftness as when we punch an oncoming ball; a suddenness as when we duck, a hesitant slowness as when we move warily with apprehension and stealth».

Few years ago, Merce Cunningham told me about the corporal memory in dance. It was not just about the movement in itself, but also about a quality it has.

When Pascal died very young, only thirty-nine years old, Baruch or Benedict Spinoza already was thirty years old. It was 1662, and the advancements on chemistry and biology were remarkable. Within the three next years, with the aid of microscopes, the cell would be discovered; and with the development of telescopes, also the planetary rotations.

Born in Amsterdam, Spinoza was of Portuguese origin – his parents had fled from the Inquisition. For him,

time was nothing more than a condition of thought. In fact, Spinoza considered everything as thought. In a letter to Henry Oldenburg, secretary of the *Royal Society*, probably written in 1665, Espinoza said: «I maintain that the human mind is a part of an infinite understanding».

He still argued that «the more things the mind knows, the better is the understanding of its own powers and the order of Nature. The better is its understanding of its own powers, because it will be able to easier orient itself and to propose rules to itself. Not only, it will better understand the order of Nature, because it will be able to easier refrain itself from what is useless» – and that was the fundamental principle for the understanding of phenomena like time.

Our repertoire is the essential basis of our competence. The more we know, not just we know more, but also we know differently.

In the fifth definition of the second part of his *Ethics*,

Spinoza claims that «*duration* is the indefinite continuance of existing», and explains the reason of his idea: «I say indefinite, because it cannot be determined through the existence itself of the existing thing, or by its efficient cause, which necessarily gives the existence of the thing, but does not take it away».

Like Peirce, Spinoza believed that all things were ideas and that we should know more and more, so we could understand the essence of things.

For Spinoza there were no miracles, because everything was God – and everything was simultaneously made up of diversity and continuity.

Spinoza already had in his mental structure the formidable revolution of Galileo. This is clear in his *Metaphysical Thoughts*, when he says that «to determine a duration now, we compare it with the duration of things that have an invariable and determined motion, and this comparison we call *time*».

Even so, Spinoza differentiated *time* and *duration*, taking *time* as nothing more than a form of thought, and *duration* as a fragment of eternity, which would put us in direct contact with the eternal and, therefore, with God.

In a certain sense, it is what happens with light – which is outside of time – and that surrounds us.

When answering to the question *what is time?*, Spinoza says: «Time is not an affection of things, but just a way of thinking or, as we have said, a being of reason; it is a way of thinking serving to the explanation of the duration. We should note here, and this will serve us later when we talk on the eternity, that duration is conceived as the bigger and smaller, as if it would be composed of parts and, finally, it is an attribute of the existence, but not of the essence» (...) «Because time is the measure of duration or better, it is nothing but a way of thinking».

Then Spinoza makes an affirmation that makes us to



think about the Big Bang and the Theory of General Relativity: «There is no time or duration before the Creation».

Isaac Newton was born eleven years after Spinoza. When he died in 1677, being forty-five years old, Newton was thirty-four.

Newton certainly knew well the life and thought of Spinoza. Oldenburg, Spinoza's friend, corresponded with both of them. Christian Huygens and Leibniz were both in contact with Spinoza. It is virtually impossible that Newton did not know his thought – and, probably, they even arrived to establish some correspondence.

1678 was the year of the great controversy between Newton and Huygens – the first arguing that light is made up of particles and the later arguing that light is nothing but waves. This dispute would have to wait until the beginning of the twentieth century with the famous *Copenhagen Interpretation*, when the paradoxical behavior of the wave-particle duality

passed to be considered as complementarities.

Nine years later, in 1687, Isaac Newton would give, in his *Philosophiae Naturalis Principia Mathematica*, a definition that would remain for decades as very first reference of the truth about the meaning of *time*: «Absolute, true and mathematical Time, being in itself, and in its own nature, it flows without relation to any external phenomenon...».

A so absolute and unique time that even a measurement would not be possible.

«...the flow of absolute time is not likely to change», Newton wrote.

But there was one person who disagreed with the position of Newton. And that person was none other than the brilliant philosopher Gottfried Wilhelm von Leibniz.

One of the surprising aspects of this correspondence

is that it was not kept directly between Leibniz and Newton, but yes with a supporter of Newton, Samuel Clarke. Alexandre Koyré and I. Bernard Cohen showed in the article *Newton and Leibniz-Clarke Correspondence*, published in 1962 in the *Archives Internationales d'Histoire des Sciences*, in Paris, that Clarke's answers were carefully prepared in secret by Newton. So, in reality, that was a correspondence between Leibniz and Newton!

Started in 1715, the correspondence lasted only until 1716 – because Leibniz died in November of that year.

About fifteen years before the beginning of that correspondence, between 1699 and 1711, along twelve years, there was a fierce dispute between Newton and Leibniz for the priority of the invention of the *infinitesimal calculus* – which would be known as the *calculus controversy*.

The controversy was based on the idea that Leibniz had not discovered independently the *infinitesimal calculus*,

but that he would deliberately created new symbols for the method invented by Newton, who fueled and coordinated the war, remaining secretly behind the scenes.

Today it is fully agreed that Leibniz was right.

For Leibniz, time was a matter of purely relational nature: «I have said more than once that I hold space to be something merely relative, as time is, that I hold it to be an order of coexistences, as time is an order of successions. (...) ...instants, considered without the things, are nothing at all and that they consist only in the successive order of things; this order remaining the same, one of the two states, namely, that of a supposed anticipation, would not at all differ, nor could be discerned from the other which now is. (...) ...how can a thing exist eternally which – to speak exactly – does not exist at all?».

For Leibniz, the relations that meant space and time – which he did not take as absolute elements – constituted

a *totality*, as his fourth letter to Samuel Clarke clearly stated: «God is never determined by external things but always by what is in himself, that is, by his knowledge, before anything exists outside himself».

But, for both of them, time was something divisible into discrete units. Time could be quantified.

This is the moment when the *Enlightenment* and formidable thinkers as Emanuel Kant – who was born three years before Newton's death and eight after Leibniz's disappearance – would establish the primacy of *free will*.

And for *free will* can exist there cannot be absolute things in Nature – continuities established by a universal causal chain. Everything must be discontinuous.

It is a universe directly related to the formidable expansion of books, of all types of publications, of *perspectivistic* mental structures, of the mechanical universe and the called

*verbal imperialism.*

Like Galileo, also for Kant any knowledge could only happen if born from the experience. And this would be, in one way or another, the basis of the thought of Peirce, Husserl, Bergson, Merleau-Ponty and also of Werner Heisenberg in addition to a countless number of thinkers.

In the *Critique of Pure Reason*, Kant makes a reflection on the time: «Time is not an empirical concept or that was removed from any experience. Because the simultaneity or the succession would not arrive by themselves to the perception if the representation of time would not intervene *a priori* as their foundation».

Kant's *a priori* is a humanization of Leibniz's concept of divine.

Kant uses the expression *representation* as a necessary projection of the fact itself: time is part of the thing, is an essential

part of the process – «Time is a necessary representation that plays the role of fundament to all intuitions». Thus, «time is an *a priori* datum».

Every time I'm in face of the word *representation*, it makes me to reflect. After all, would a kind of *double* of the object, a *representation*, exist or what exists is in itself the thing? Being the thing in itself, it would exist where it would appear, and the idea of *representation* would simply disappear.

Kant uses the word *representation* as being something that is beyond volition, as something that manifests from the object and that leads to relations, such as the establishment of a natural condition or, advancing in the Theory of Information, it happens with the noise – while design of interference of a medium.

Interestingly, we realize, however, that music can never be *represented*. A recording of music is not its representation, but only itself, the music itself. A photograph can be a representation

of a face even though the two-dimensional surface of the paper is of a nature totally strange to the topology of the human face, for example. But we recognize it as *representation*.

We can create a musical notation, but it would not be a *representation* of the music – it will only be a way to lead to the music, always in an approximate way.

Nothing in time can be *represented*. Only what is in space allows *representation*. And this is a key to understand the nature of time.

But Kant did not think exactly like that. He said that in time «there is only one dimension; different times are not simultaneous but successive – in the same way that different spaces are not successive but simultaneous». And these propositions, he said, could not be apprehended from the experience, because they are an *a priori* condition. «...even though the concept of change», Kant continues, «and with it the concept of movement – like the change of place – is only



possible through and in the representation of time; and then, if such representation is not an intuition – internal and *a priori* – no concept, whatever it can be, will be able to make comprehensible the possibility of change, that is, the possibility of a connection of contradictorily opposed predicates – for example, the fact of being in a place and the fact, for the same thing, of not being in that same place – in a single and same object. Only time those two contradictory opposing determinations can find each other in a thing, namely in a *successive form*».

Contrarily to Newton, and like Leibniz, Kant considers that «time is not something that exists by itself or that can be linked to things like an objective determination and that, consequently, subsists when an abstraction of all subjective conditions of intuition of things is made».

To Kant, «time is but the form of the inner sense, that is, of the intuition we have about ourselves and about our inner state» – an affirmation that would be embraced by Husserl and that would be largely proved by neurological experiments in

the beginning of the twenty-first century.

Kant argued that time is the essential condition of phenomenology, while space is the pure form of an external intuition.

Still in his masterful *Critique of Pure Reason*, Kant made clear what he considers the nature of time: «Time, in which all the changes of appearances should be thought, remains and does not change; because it is that in which a definition can be conceived of changes or sameness. Now, time itself cannot be perceived. Consequently, the substratum must be found for perceived objects, that is, appearances, which introduces time. These appearances can be perceived in all change or sameness by the relation of the appearances in the apprehension. However, the substratum of all reality, i.e. what belongs to the existence of things, the substance, in which everything has existence, can only be intended as a definition».

In 1802, Philip Otto Runge – painter of children,

correspondent with Goethe, mystical and romantic – wrote to his father: «The art of all times has clearly taught us how humanity has changed, how the same age has never returned again». This is something that only someone with an intensely visual approach on time could realize – a time distributed on a line of causal events in a single direction.

Georg Wilhelm Friedrich Hegel was thirty-four years old when Kant died.

It's hard to imagine a philosopher who has had so many admirers and so many detractors as Hegel. Peirce did not like his ideas – but much of what Peirce developed was due to Hegel's thought, even though he has always indicated that his principal reference was Kant.

Marx said that he never wrote a treatise on aesthetics because that one made by Hegel was simply insurmountable.

John Dewey, Jean-Paul Sartre and Alexandre Kojève

among others, never hid their admiration for Hegel's ideas. On the other hand, those ideas were strongly rejected by Schelling, Søren Kierkegaard, Arthur Schopenhauer, Nietzsche, Karl Popper and even by Bertrand Russell.

For Hegel, free will was fundamental with all its implications for the understanding of the human dimension. For him everything was part of a process in permanent interactions and overcomings.

Thus, being time the result of interactions and overcomings in the most diverse dimensions, to Hegel everything points to the *history* – while process of self-selection of events that design it. And the same would happen, like a fractal body, with the formation of ideas.

In his famous *Phänomenologie des Geistes* – *Phenomenology of the Spirit* – of 1807, which originally had the title of *Science of the Experience of Consciousness*, Hegel said that «what is indicated is the *now*, this *now*, *now*. But while it

is indicated, it no longer is. The *now* that *is* is another, not what was indicated, and we see that the now is just that: while it is, it no longer is. The now as it is indicated to us as is a now that already was. This is its truth and it doesn't have the truth of being. Nevertheless it is true that it already was. But what *was*, indeed, *is not* an *essence*. *The now is not*, and yet, the question arose about the self. In this indication we see, therefore, only one movement and see its course as follows: 1. I indicate the now and it is asserted as true; I point out it, however, as something that already was or as something suppressed, I suppress the first truth, and 2. Now I affirm as second truth that it *already was*, it is suppressed. 3. But what already was, is not; I suppress the have-been or the being-suppressed, that is, the second truth and, then, I deny the denial of the now and return to the first statement, that is, that the *now is*. The now and the indication of the now, therefore, are constituted in such a way that neither the now nor the indication of the now are something simple and immediate, but a movement that has in itself several moments. (...) ...a now that absolutely is many *now*. This is the true now, the now like a simple day, which has

in itself many now, that is, the hours. (...) It is clear that the dialectic of sensitive certainty is nothing but the simple story of its movement or of its experience, and sensitive certainty is nothing else this history».

Thus, for Hegel, the present, as matrix of time, nothing more is than the result of a chain of conflicts, generating each time a new overcoming. And he recognizes such process of selection of the truth, of what indicates the reality, as the essence of the *history*.

When the Danish philosopher Søren Kierkegaard was born in 1813, Hegel was forty-three. Kierkegaard died young, in 1855, at forty-two years old.

To Kierkegaard, radical defender of Christianity, the only road to freedom was total subjectivity: «The difference between Christianity and Hegelianism is more in that precise point than the speculation aims to teach us that the road to survival is to make everything objective, while Christianity teaches us that

the road to survival is to make everything subjective, that is, to become truly subject».

Being everything subjective, the idea of time is, for him, directly related to repetition, which is related to the idea of *reminiscence*. Thus, all knowledge would be *reminiscence* – as Plato believed.

The question of subjectivity was so central to Kierkegaard that he would say «I feel, therefore I am», joking with Descartes' *cogito*.

«Repetition and to remind represent the same movement, but in opposite directions; because that we remember of what was is a repetition backwards. On the other hand, we remember the true repetition going forward» – said Kierkegaard. And while he affirmed that «repetition is reality, it is the seriousness of existence», it would happen in each one of us, while purely subjective element. Therefore he also said that «repetition is, in fact, what we roughly call meditation».

Kierkegaard also highlighted the novelty that repetition has, like the time – which is always discovery – and strengthened, as if throwing himself on some of Pascal's thoughts, ideas that, with Nietzsche, would generate the principle of the *eternal return*, or *eternal recurrence*.

Even if everything was designed by an *eternal return*, the human experiments would always be full of novelty, of discovery: «When the Greeks said that all knowledge is reminiscence, they understood why everything that is already was; and when we say that life is a repetition, this means: the life that already was is present now. (...) Reminiscence is the pagan conception of life, repetition is the modern one. Repetition constitutes the *interest* of metaphysics, as well as it is the key word of the whole conception of ethics, the *conditio sine qua non* of any dogmatic problem».

By this means, for him, repetition was also an event of transcendental nature.



Besides philosopher, Nietzsche was also a musician – and the music is directly related to the principle of repetition. He loved and hated Richard Wagner. At twenty-five years of age he acquired the Swiss citizenship.

Contrary to what many believe, he never was anti-Semitic – he even fought against the anti-Semitic. But his sister, after his death, faked some of his writings in order to defend the Nazi cause, which earned him the terrible fame.

He lived almost permanent crisis of madness during his last ten years. He died in 1900, at fifty-six years of age, probably – as shown by recent studies – due to a brain tumor.

In its *Second Intempestive Consideration*, of about 1874, Nietzsche would make an interesting allegory involving the human and the animal: «the representation of *coexistence* is not possible in mere time; it depends for its other half on the representation of *space*, because in mere time everything is

*successive*, whereas in space all things are *side by side*. Therefore the representation of coexistence arises first through the union of time and space. *If, on the other hand, space were the only form* of representations of this class, there would be no *change*; for alteration or change is *succession* of states, and *succession* is only possible in *time*. Therefore time can also be defined as the possibility of opposite conditions in the same thing. Thus we see that although, as is well know, the two forms of empirical representations have in common infinite divisibility and infinite extension, they are nevertheless fundamentally different. And so what is essential to the *one* form has absolutely no meaning in the *other*; juxtaposition has no meaning in time, succession none in space. But the empirical representations, belonging to the ordered and regulated complex of reality, appear in both forms simultaneously; in fact an *intimate union* of the two is the condition of reality. To a certain extent reality grows out of them as a product out of its factors».

To Nietzsche, time is memory. In this way, time is different for a child or for an old person. Time is something personal, like

the consciousness and the suffering.

To him, happiness is in oblivion, in the absence of time: «the smallest and the greatest happiness are always created for one thing: the power of oblivion...».

The principle of justice is, as any legal system in any society, based on the capacity of oblivion – there is no justice without some kind of oblivion, all legal systems are based on the forgetfulness.

«Every action requires oblivion, as every organism needs not only light but also darkness. (...) You can live practically with almost no recollection, you can be really happy, and the animal is an example, but it is absolutely impossible to live without forgetting».

To Nietzsche time is nothing more than the design of oblivion, of the absence of knowledge – as, in some sense, the theoretical physics of the twenty-first century would show.

But forgetfulness, in some mysterious way, is linked to repetition – because the oblivion still exists in itself. If it were memory definitely erased, it could not be forgotten, but would be simple disintegration.

Forgetfulness leaves, necessarily, its vestiges, the possibility of restoration, which ensures that it existed while memory.

How this element could designate the form of time? Nietzsche has the answer: the *eternal return*. Thus, time would be a cyclical process, where the oblivion is part of its basic structure: «My friends, I'm the one who teaches the eternal return. See: I teach that all things eternally return in yourselves with them, and that you've been there a countless number of times and all things with you: I teach that there is a great, long, an immense year of the future, which once reached returns like sand, tirelessly, so that all these years are always equal to themselves, in the smaller and in the larger things. And I'll say

to a dying man: 'See, die and erase yourself in the present, and disappear...».

Schopenhauer was fifty-six years older than Nietzsche. When he died in 1860, Nietzsche was just sixteen years of age.

Schopenhauer was one of the strongest influences on Nietzsche. He was the introducer of Buddhism and of the Indian thought in German philosophy.

He took from Kant the idea of *representation*.

This backward chronological movement, throwing him into the middle or even toward the end of the nineteenth century, is due to some of his revolutionary ideas. Schopenhauer is one who establishes the possibility of a *telecausality*, a rupture with the logical fundament introduced by Aristotle over two thousand years before.

Arthur Schopenhauer was born in 1788, was eighteen

years younger than Hegel and, like Kierkegaard, fought strongly against the ideas of Hegel, throughout his whole life.

Schopenhauer asked himself in his work *On the Fourfold Root of the Principle of Sufficient Reason*, of 1813, about the nature of the interior and exterior sensory faculties – what he respectively called *time* and *space*.

The concept of *history* implies the coexistence of elements in time. Otherwise, there could be no *historical moments* that unchain transformations – as Hegel believed.

To Schopenhauer «the representation of *coexistence* is not possible in mere time; it depends for its other half on the representation of *space*, because in mere time everything is *successive*, whereas in space all things are *side by side*. Therefore the representation of coexistence arises first through the union of time and space. *If, on the other hand, space were the only form of representations of this class, there would be no change; for alteration or change is succession of states, and succession is*

only possible in *time*. Therefore time can also be defined as the possibility of opposite conditions in the same thing. Thus we see that although, as is well known, the two forms of empirical representations have in common infinite divisibility and infinite extension, they are nevertheless fundamentally different. And so what is essential to the *one* form has absolutely no meaning in the *other*; juxtaposition has no meaning in time, succession none in space. But the empirical representations, belonging to the ordered and regulated complex of reality, appear in both forms simultaneously; in fact an *intimate union* of the two is the condition of reality. To a certain extent reality grows out of them as a product out of its factors».

Thus, for him, reality is not the result of a continuous process of conflicts, but rather a sort of symbiosis between different logical principles.

The old concept of Newton's *absolute time* – which still survived with Schopenhauer – would be radically transformed into an absolute inexistence by the physicist and philosopher

Ernst Mach already in the nineteenth century: «Time is an abstraction we obtain in the change of objects because we do not base ourselves on a concrete measure, because all they are interconnected», he wrote in 1883.

Already belonging to the world of photography, the invention of cinema, radio and the beginning of a more intensive use of glass in buildings, Ernst Mach approaches time as something entirely lacking, like an illusion – but, tellingly, it indicates that everything is *interconnected*.

Charles Sanders Peirce was the translator of the book of Mach in the United States and totally disagreed with his ideas. For Peirce, even if everything is interconnected and could appear paradoxical relations, time is something concrete, like the sign. For him, the concreteness of things is exactly in the interactive dimension.

On twenty first of September, 1908, Hermann Minkowski, Albert Einstein's teacher, said at the 80<sup>th</sup> *Assembly of Natural*



*German Scientists and Physicians* that «henceforth space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality».

Minkowski died tragically in the following year, in 1909, only forty-four years old, victim of a ruptured appendix.

In 1903, Einstein – who used the conceptual tools of his master in the elaboration of his thesis – argued that «all judgments in which time has a role refer to simultaneous events».

Here the *Theory of Relativity* was born, in its broader approach. Time and space pass to be vectors of a same phenomenon.

Time passes to be considered as the fourth dimension.

The *Cubism*, launched by Pablo Picasso and Georges

Bracque, nothing more was than the incorporation of the new concept of time established by the Theory of Relativity. Interestingly, although this fact was commonly commented at that epoch, it ended to fall almost into oblivion over the years.

The apparently distorted figure in the *Cubist* painting actually is a single figure taken at different times, as if the approach to different moments in a single image could reveal the essence of its object.

*Les Demoiselles d'Avignon*, by Picasso, dated of 1907, is a remarkable example of how this happens.

Time passes to be matter in the Universe!

The *Theory of Relativity* demonstrates that in regions near large bodies of matter, time is slower.

A very interesting phenomenon, which is rarely perceived by people, is that at the speed of light time ceases to exist.

According to the *Theory of Relativity*, light travels at a constant speed of three hundred million meters per second, or almost one billion feet per second – when time no longer exists.

So, surrounded by light, we live inside an environment without time; because light is something that is out of time!

## ZERO

*The trouble with our time is that the future is not what it used to be*

*Paul Valery*

After the *Theory of Relativity*, the concept of time passed to reveal a paradoxical reality, as a new logical framework.

In the universe of general relativity, time as space-time vector is also an absolute entity. It can contract or expand, but has an existence.

And the old Newtonian framework in relation to time simply disintegrates.

In the same way, the primacy of the principle of *free will* gradually becomes less evident with the beginning of the twenty-first century.

For thousands of years, the concept of time wavered between different poles.

Aristotle created the conceptual support for this conflict with the mathematical principle of the *excluded middle* – *a* or *non-a* – which William Shakespeare transformed into the classic formula: *to be or not to be*. That is, only one condition is admissible in the existence.

The *excluded middle* principle put generations of philosophers in great difficulties when they tried to harmonize the vision of an eternal world with the existence of miracles, or even with an Apocalypse, an end of times.

But the emergence of the *real time* has transformed that

ancient world of oxymorous oppositions into a condition of a different nature.

The concept of time passed to be, simultaneously, relative and absolute, in an apparent paradox.

In the beginning of the twenty-first century, the American physicist Robert Mallett, a professor at the University of Connecticut, started the construction of a *time machine*.

Mallet lost his father when he was ten years old and decided to dedicate his entire life creating a time machine to allow him to go back and save the father.

The project is based on the principles of Albert Einstein's *Theory of Relativity*. If a great mass of matter warps space-time, a set of laser beams in spiral could have enough power to warp space-time, opening a kind of tunnel for other temporal dimensions.

Interestingly, in 1937, a Scottish physicist named Willem Jacob Van Stockum – tragically killed during the World War II on a mission as pilot of the Canadian Air Force – established an interesting mathematical scenario for the *Theory of General Relativity* according to which if we would have a very long cylinder in very fast rotation, the distortion of fields would produce a machine back to the past, a time machine.

If such a project would be possible, we would have the called *cyclic temporal paradox*. That is, if Mallet would be able to go back and save his father, he would not have had any reason to build a time machine and, therefore, it would not exist. If it would not exist, his father would be dead.

David Lewis alerted in his famous article *The Paradoxes of Time Travel*, published in 1976, another paradoxical element – the actual knowledge of Mallet only could exist in the future, and never before to exist, to be elaborated after all types of associations. «If a time traveler visiting the past both could and couldn't do something that would change it, then there cannot

possibly be such a time traveler», said Lewis.

In his 1976 article, David Lewis told the story of a boy who hated his grandfather, for having been a merchant of ammunition for weapons, and decided to travel back in time to assassinate him. From this fictional story, Lewis examines the paradoxes that it entails.

But in 2002, Alexander R. Pruss, philosopher at the Georgetown University, challenged the ideas of Lewis: «And once we depart from the realm of most everyday counterfactuals, we can find a number of cases where Lewis's analysis breaks down. If the antecedent of the counterfactual is something like a neuron firing, or a button depressing in a locked box, the Lewisian analysis fails to demonstrate a past-future asymmetry grounding our view of the future as open and of the past as closed».

Mallet makes clear that the real goal of his project is to transport to the past *just* few subatomic particles, which would



be a gigantic first step in the construction of a future complex and large time machine.

Interestingly, the idea of traveling to the future requires a belief that everything has already happened in all times; and the travels to the past imply that everything still exists in another time – in both cases denying, in some way, the very existence of time.

In 1939, the American Navy would have hired Albert Einstein and Nikola Tesla for the development of a powerful weapon of war. A device that could literally make invisible the American ships. Based on Einstein's theories, the principles that guided that project were similar to those used by Robert Mallet.

Tesla would have alerted to the fact that the use of large concentrations of energy could open a door in space-time, not only making invisible the object.

This operation became known as the *Philadelphia Experiment*. Precisely at the end of it, on January seven, 1943, Nikola Tesla died at eighty-six years of age.

It was never knew what really happened with the mysterious *Philadelphia Experiment*. Some people believe that Nikola Tesla was a victim of his own experience and is now lost in space-time.

In fact, Nikola Tesla had his funeral at the Church of St. John the Divine, in Manhattan, on January twelve, 1943, having been present more than two thousand people.

Another possibility of time travel passed to be the use of *black holes* and the so-called *wormholes* – first established by physicist Carl Schwarzschild in 1916.

According to this theory, the mass of a black hole would be so great that it would produce a fabulous distortion in space-time around it, creating a passage to another space-time

location in the Universe.

In 1957, John Archibald Wheeler – who coined the term *black hole* – would designate those passages of time as the *Gates of Time*.

Eight years earlier, in 1949, the brilliant mathematician Kurt Gödel – who became famous for his *Incompleteness Theorem* – established a model for the understanding of the space-time in terms of the *General Relativity*, known as *closed time curves*, according to which there is a possibility in space-time return to the same state.

In that text, which was dedicated to Einstein, Gödel questioned: «if someone can travel in time, how could the time we know exist in those other universes, having always present the past?».

That short paper, Kurt Gödel launched what would become popularly known as the *Grandfather Paradox*: if

someone goes back in time and kills his grandfather, he will automatically make impossible his own existence – paradox that would justify the criticism against Robert Mallet and that is exactly the essence of David Lewis' text.

A paradox showing the violation of the principles of causality.

Still in the nineteenth century, Arthur Schopenhauer already challenged the possibility of the existence of a *tele-causality* – that would designate part of the characteristics of time according to the *Superstring Theory*.

In the late twentieth century, Ilya Prigogine point to the fact that we experience, in fact, what was already indicated by the Sumerian word *ti*: the irreversible arrow of time and life.

But John Wheeler would give the answer: everything would depend on the scale. In very large or very small scales, time would be symmetrical, past and future would coincide.

A radical transformation.

Depending on the scale, time passed to be symmetrical or asymmetrical.

Being a kind of matter, time became absolute – but being, simultaneously, totally relative. If speed is increased, time is decreased; if the scale is changed, the nature of time is immediately transformed.

François Jacob, Nobel Prize in biology in 1965, said that «the representation of the world built by the human being is always largely a product of imagination».

And what we are dealing here is exactly about imagination. How our imagination – and this is an aesthetic issue – has been changed over the centuries, and with it also everything we know.

*Imagination* does not mean reverie without method – but yes, image and action in a coherent process of memory.

In 1987, at a symposium on physics, in Goa, India, after the works by Carlo Rovelli, Lee Smolin and Abhay Ashtekar's, a revolutionary theory known as *loop quantum gravity* was born.

Carlo Rovelli said in 2004 that «the entity space doesn't exist. Only the gravitational field exists, in the same way as other fields. In quantum gravity, loops are the quanta of the gravitational field and their relations are what constitute space. (...) Today, the novelty that arrives to us about quantum gravity is that space does not exist. Only the gravitational field exists which, as I said, is made of clouds of probabilities of grains rewired in network. But combining this idea with special relativity, we must conclude that the non-existence of space also implies the non-existence of time. In fact, it is exactly what happens on quantum gravity: the variable "t" does not appear in the Wheeler-DeWitt equation, neither after in the basic

structure of the theory».

Thus, time and space would be gravitational phenomena and, as Rovelli says, «we should not think the time as if a cosmic clock would exist, putting the life of the Universe in rhythm. We must think the time as something local: each object in the Universe has its own time. (...) At a fundamental level, time does not exist».

Given this scenario, we wonder about everything that was thought by people like Aristotle, Galileo, Kant or Leibniz. If time does not exist in fundamental terms, is it just an illusion? Would we be immersed in an eternal solipsism in face to the physical reality?

To Rovelli, «the idea that allows us to rediscover a macroscopic time from a timeless fundamental theory is that time arises only in statistical thermodynamic context. Another way of saying this is that *time is an effect of our ignorance about the details of the world*. If we knew perfectly all the details of

the world, we would not feel the flow of time. I have worked hard on this idea and on the mathematical idea that supports it: it must show how the typical phenomena associated with the passage of time can emerge from a timeless world, because we have limited knowledge».

Rovelli's idea reminds us Nietzsche when he said: «Every action requires oblivion, as every organism needs not only light but also darkness. (...) You can live practically with almost no recollection, you can be really happy, and the animal is an example, but it is absolutely impossible to live without forgetting».

Concurrent with the loop quantum gravity theory is the Strings Theory. But the Roveli himself believes that both of them can be complementary.

Not only in relation to the *Strings Theory*, the very emergence of these theories implies a condition of complementarity, and no more of exclusion, refutability or



overcoming.

Suddenly, in full twentieth century, we saw the disintegration of what could be called *normal standards* established by the Aristotelian principle of the *excluded middle*.

To understand how that happened it is important to refer the work of the brilliant Romanian physicist and philosopher Stephanie Lupasco.

In 1951, Lupasco laid the foundation of one of the great revolutions of Western thought, already announced – although not directly – by Charles Sanders Peirce and Arthur Schopenhauer.

Over the centuries, our entire reality has been coined by the principles of local causality and the *excluded middle*.

But Lupasco launched the principle of the *included middle*

as an essential element for the understanding of reality.

In his book *Le principe d'antagonisme et la logique de l'énergie*, published in 1951, Stephanie Lupasco defended that «to any phenomenon or element, or any logical event, and therefore the judgment that thinks it, to the proposition that expresses it, to the sign that symbolize it: *and*, for example, should always be associated, structurally and functionally, to a anti-phenomenon or anti-element, or a logical anti-event, and so to a judgment, a proposition, a contradictory sign: *not-and*; and in such sort that *and* or *not-and* can never cease to be potentiated by the actualization of the *not-and* or of the *and*; but they do not disappear so that; being *not-and*, being *and*, they can suffer themselves from an independence and, therefore, from a strict non-contradiction – as in any logic, classical or other, based on the absolute of the non-contradiction principle».

This is about an evident event in the phenomenon of the existence of the photon, simultaneously particle and wave,

or even in quantum physics, which served as the basis for his thoughts.

Basarab Nicolescu said, rightly, that for Lupasco «the whole system is a system of systems».

Now, it no longer is the question of to be or not to be, but yes, to be *and/or* not to be.

If we recall the basic principles of the method created by Charles Sanders Peirce, taking time as sign, we can understand how this apparently paradoxical universe happens.

Charles Sanders Peirce developed a method for the understanding of the phenomena of language he called *General Theory of Signs*.

The essential principle of such method – which is not based on the verbal language, as it happens with Ferdinand de Saussure – establishes that every sign, a kind of *informational*

*quanta*, is articulated by three poles, three categories of signs, which merge each other and become one in the sign.

In fact, Peirce's method is a strongly fractal process, because the meaning of a sign is another sign of a different nature.

To his categories, which we could also consider as poles or singularities, he called *one*, *two* and *three*.

To the *one* he attributed the nature of the relations of quality, for which there is no possible opposition. That is the nature of the present, for which there is no opposition and, in a certain sense, even possible intellection, because when we perceive and understand, it is already past.

To the *two*, Peirce designed the relations of existence – because everything that exists has its opposite. Light and darkness, sound and silence, in short, every relation of existence is established by opposites, it is about the concrete world, and

that's the past.

But when we think on it, the past becomes, in some sense, future – because it is projected ahead of its time. It is the *reason*, the number *three* for Peirce.

The same happens to any sign.

But a sign can never be only one of its parts, a single category. The three categories are paradoxical and, simultaneously, a single thing. Even so, each category also cannot have its own existence.

The logic to understand the sign according to the theory elaborated by Peirce is that of the *included middle*.

Simultaneously, to be and not to be.

Few people understand this and the formidable leap that Peirce's ideas represent.

His considerations about time are many and illustrate the logical root of his thought: «If on a Monday an idea be possible, in the sense of involving no contradiction within itself regardless of all mere circumstances, then it will be possible on Tuesdays, on Wednesdays and on Fridays; in short it will be possible forever and ever, unless the ideas of circumstance should come into definite rational contradiction to the idea in question. Consequently, mathematical Time cannot have an arbitrary beginning nor end. For it is a possibleness; and what is possible at all is possible without limit, unless there be some kind of a limit which comes into definite rational contradiction with the idea of Time».

But, in an article published in *The Monist*, in October of 1905, whose original title was *The Consequences of Pragmatism* was later amended by Peirce himself, to *Issues of Pragmatism*, Charles Sanders Peirce gives us an even more direct view about the reality of time: «What is time? It is not proposed to attack those most difficult problems connected with the psychology,

the epistemology, or the metaphysics of Time, although it will be taken for granted, as it must be according to what has been said, that Time is real. The reader is only invited to the humbler question of what we mean by Time, and not of every kind of meaning attached to Past, Present and Future either. Certain peculiar feelings are associated with the three general determinations of Time; but those are to be sedulously put out of view» – as if he was writing a message to McTaggart, his contemporary.

«What is the intellectual purport of the Past, Present and Future? ... That Time is a particular variety of Objective Modality is too obvious for argumentation. The past consists of the sum of facts accomplished, and this Accomplishment is the Existential Mode of Time. For the Past really acts upon us, and *that* it does, not at all in the way in which a Law or Principle influences us, but precisely as an Existent object acts. For instance, when a *Nova Stella* bursts out in the heavens, it acts upon one's eye just as a light struck in the dark by one's own hands would; and yet it is an event which happened before the Pyramids were built. A

neophyte may remark that its reaching the eyes, which is all we know, happens but a fraction of a second before we know it. But a moment's consideration will show him that he is losing sight of the question, which is not whether the distant Past can act upon us *immediately*, but whether its acts upon us just as any Existent does. The instance adduced (certainly a commonplace enough fact) proves conclusively that the mode of the Past is that of Actuality. Nothing of the sort is true of the Future, to compass the understanding of which it is indispensable that the reader should divest himself of his Necessitarianism, – at best, but a scientific theory, – and return to the Common-Sense State of Nature. You never say to yourself, 'I can do this or that as well tomorrow as today'? (...) Be true in theory or not, the unsophisticated conception is that everything in the Future is either *destined*, i.e., necessitated already, or is *undecided*, the contingent future of Aristotle. In other words, it is not Actual, since it does not act except through the idea of it, that is, as a law acts; but is either Necessary or Possible, which are of the same mode since Negation being outside the category of Modality cannot produce a variation in Modality. As for the Present



instant, it is so inscrutable that I wonder whether no skeptic has ever attacked its reality. (...) How, then, does the Past bear upon conduct? The evidence is self-evident: whenever we set out to do anything, we only draw upon our memory. (...) In short, the Past is the sole storehouse of all our knowledge. (...) Thus, from whatever point of view we contemplate the Past, it appears as the Existential Mode of Time. How does the Future bear upon conduct? The answer is that future facts are the only facts we can, in a measure, control; and whatever there may be in the Future that is not amenable to control are the things that we *shall* be able to infer, or *should* be able to infer under favorable circumstances. ...the conclusion of a Reasoning proper must refer to the Future. (...) What is bearing of the Present instant upon conduct? Introspection is wholly a matter of inference. One is immediately conscious of his Feelings, no doubt; but not that they are feelings of an *ego*. The *self* is only inferred. There is no Time in the Present for any interference at all, least of all for inference concerning that very instant. Consequently the present object must be an external object, if there be any objective reference in it. The attitude of the Present is either

conative or perceptive. (...) The consciousness of the Present is then that of a struggle over what shall be; and thus we emerge from the study with a confirmed belief that it is the Nascent State of the Actual. (...) Time is unique and *sui generis*. In other words there is only one Time».

According to his *General Theory of Signs*, Charles Sanders Peirce takes the past as relation of existence, par excellence, and therefore a *secondness*; the future as a product of reason, of control, and thus a *thirdness*; and the present as *firstness*, icon, relation of quality. But time is the fusion of these three categories – and therefore can only be one.

That is the reality of *real time*. We are and we're not, as Heraclitus said.

In one of his lectures of 1898, in Cambridge, Massachusetts, that initially had the title of *Time and Causation*, and was eventually changed to *Causation and Force*, Peirce made a further reflection on time: «What is Time? Shall we say that it

is the form under which the law of logical dependence presents itself to intuition? But what is logical dependence objectively considered? It is nothing but a necessitation which instead of being brute is governed by law. Our hypothesis therefore amounts to this, that time is the form under which logic presents itself to objective intuition; and the signification of the discontinuity at the actual instant is that here new premises not logically derived by Firsts are introduced».

Even if we may consider time as unique – incorporating the whole diversity of our bodies and our societies – even so, what we *think* about it, what Husserl defined as *phenomenon*, is a constant metamorphosis, based on what Peirce defined as *necessity*.

Reality of what is *necessary* in a world taken as technocratic or technological through the effervescence of what we might call *degenerated techniques*.

The entire planet, from the richest to the poorest places,

passed to be constituted by virtual tools.

For the first time, the use of techniques no longer depends on direct action.

Touch a button and automatically trigger an action without direct involvement or even knowledge of *how to do* by the person.

When someone uses a computer, for example, he doesn't know how it works, he has no knowledge of *how to do*. He only knows that touching its surface will cause an indirect action, like prosthesis.

They are degenerated techniques because they happen in a second instance. But, paradoxically, they are immediate – without mediation – because the outcome of their operation takes place in *real time*.

The act of to do and the time implicate another interesting

concept: the *sacred*.

The word *sacred* launches its ancient etymological roots in the Indo European \**sak*, showing us the idea of *non-opposition*. The radical of this root is \**s* that indicated the ideas of *connection, neighborhood, union, interface, contact*.

It is the oldest known root of the Latin expression *sum*, which means *to be* and that shows us how the very existence is nothing but a complex network of symbiotic relationships.

Other words also appeared from that same root, such as *similarity, consecration* or even *saint* – illuminating their usual meanings.

Thus, the *sacred* is what binds us, not only to ourselves, but with things and with others.

On the other hand, the word *profane* comes from the root \**fes* which, in its turn, may be linked to the Indo European

\**dha*, which indicated that the idea of *light*. The root \**fes* also indicated the idea of the *temple*, giving to the word *profane* the meaning of something that is *outside the temple, outside the sacred*.

Some relate \**fes* to the Latin *fari*, which gave rise to the word *fable*.

All these expressions related to the profane are directly associated with vision.

Anything that involves the profane is related to division, to departmentalization and to classification.

While hearing is especially inclusive, vision is a strongly departmentalizing sensory faculty – and that is the very first nature of the *sysstasis*.

We cannot close our ears. There is no real opposite for a song – play it backwards does not mean to invert it, but to

reverse.

The intensive use of vision produces what we call *stereotype* and *format*. The word *stereotype*, which literally means *solid type*, was born from the use of the Gutenberg press and was the term used to designate the printing mode using a solid plate, previously recorded.

Stereotype is generated by uniform behavioral routines established in a strongly hierarchical framework of values, that is, in a *format*. For example, when we follow sightseeing process the tour guide always makes the same movements, with measured time. The same happens when we follow a manual of operations or a recipe. There we meet in high definition all steps and their order, with a specialized purpose.

Not coincidentally, the famous *Codex Calixtinus*, or *Liber Sancti Jacobi* was written between the years 1130 and 1160 – when Europe already intensified the use of paper and of the phonetic alphabet preparing, in this way, the foundations for

the emergence of the technology known as *flat perspective*.

The fifth and final book of the *Codex Calixtinus*, *Iter pro Peregrinis ad Compostellam* – or Pilgrim's Guide to Santiago de Compostela – is considered the first known tourism guide. It could only have been created inside an environment of visual intensification, when the *stereotype* gradually passes to dominate the structure of thought.

Literature is closer to such universe of uniform routines, while poetry is not.

Routines are a reference to time. When the repetition is transformed into a diagram, and from it a map of action is defined, we have the stereotype. Then, the things are connected by predictable: the map of the action in time.

When we don't have such a diagram and we have time free from routines, have the sacred – then everything is connected by the unpredictable.



Therefore, the most diverse societies worship fire as a sacred element. And also because of this, many of us feel the sacred when we are inside an empty temple. It is not the temple in itself what produces that sensation, but the time free from the bonds established by norms and social rules.

Visual societies tend to be more stereotyped and more profane.

In an acoustical society all tend to be more “alike” to each other – which is interestingly revealed in the Byzantine mosaic and sculpture.

Everything related to time. Profane societies have time counted. Societies oriented to the sacred have free time.

When we ask about the form of time, the concept of time, it is, in fact, the concept of our own world, our lives.

The great Swiss philosopher René Berger said that «the so defined sensory experience is permanent, from our birth to our death. It corresponds to a placing in perspective the world that contains our identity and our duration. But our perception very often passes not through the ‘direct contacts’, but through images that work ‘in substitution’ (...) ...every technical invention also involves the establishment of new behaviors, new contents and new audiences (...). Let us add that, as we recur to technical devices, we also recur, usually unconsciously, to mental devices, which might be called cultural patterns, widely studied by linguists, ethnologists and anthropologists. (...) This relation also involves a ‘time factor’ that was made decisive nowadays. Before, it was produced according to durations and experiences corresponding to our classical culture. Today, it explodes in many numerous places we can get almost instantly».

For each one of us, time only happens, in fact, in the *present*, while consciousness, and the present is nothing but the boundary between perception and memory – spread to

every cell of our bodies.

What reminds us of John Archibald Wheeler and Jean Piaget when the first said that «the boundary of a boundary is zero», and the second that «to understand time is to get freed from the present».

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Emanuel Dimas de Melo Pimenta has been considered by many as one of the most interesting musician, architect, photographer and intermedia artist of the world at the beginning of the third millennium – according to statements written by personalities like John Cage, Ornette Coleman, Merce Cunningham, John Archibald Wheeler, René Berger, Dove Bradshaw, Daniel Charles, Phill Niblock or William Anastasi among others.

His works are included in some of the most important art collections and world-wide recognised institutions like the Whitney Museum of New York, the ARS Aevi Contemporary Art Museum in Sarajevo, the Biennale of Venice, the Cyber Art Museum of Seattle, the Kunsthaus of Zurich, the Durini Contemporary Art Collection, the Bibliothèque Nationale of Paris and the MART - Modern Art Museum of Rovereto and Trento among others.

He develops music, architecture and urban projects using Virtual Reality, cyberspace technologies and based on neurosciences.

In 2008 he created the first opera on Dante Alighieri's the Divine Comedy in the history of music, with the world première at the Abstracta Festival, in Rome, Italy. In 2009, his concert CANTO6409, created in partnership with the Italian movie director Dino Viani, who was responsible for the film, is acclaimed at the International Film festival of Cannes, in France.

His works are included in the *Universalis Encyclopaedia* (Britannica) since 1991, in the *Sloninsky Baker's Music Dictionary* (Berkeley), the *Charles Hall's Chronology of the Western Classical Music*, as well as in the *All Music Guide – The Expert's Guide to the Best Cds* among others.

Legendary musicians like John Cage, David Tudor, Takehisa Kosugi, John Tilbury,

Christian Wolff, Martha Mooke, John DS Adams, Maurizio Barbetti, Michael Pugliese, Umberto Petrin, Susie Georgetis, Audrey Riley and the Manhattan Quartet among others have performed his compositions.

He collaborated with John Cage, as commissioned composer for Merce Cunningham, from 1985 until his disappearance in 1992. He remained commissioned composer for Merce Cunningham in New York until his disappearance in 2009. His works are part of the Legacy project of the Cunningham Foundation for concerts and performances between 2010 and 2013.

His concerts have been performed in some of the most prestigious theatres all over the world, like the *Lincoln Center* and *The Kitchen* in New York; the *Opera Garnier* or the *Theatre de La Ville* in Paris; the *Shinjuku Bunka Center* in Tokyo, the Montpellier Municipal Theatre, the Festival of Aix en Provence, the Modern Art Museum MASP in Sao Paulo, *La Fenice* in Venice, and the Biennale of Sao Paulo among others.

Articles on his works have regularly appeared in different newspapers and magazines, like *The Wire*, *Ear*, *New York Times*, *Le Monde*, *Le Parisien*, *Liberation*, *O Estado de Sao Paulo*, *O Expresso*, and *O Globo*, *Il Sole 24 Ore* and *la Repubblica*, among others.

With more than four hundred musical compositions already recorded, twenty published compact discs, four cd-roms, he has wrote and published about thirty books, several of them individually, several papers, articles and electronic books. His works have been regularly published in England, the United States, Japan, the Netherlands, Portugal, Brazil, Germany, Canada, Switzerland, Hungary, Italy and Spain.

He has also been curator for various institutions, like the Biennale of Sao Paulo,

in Brazil; the Calouste Gulbenkian Foundation, in Portugal; the Triennial of Milan, in Italy; and the Belem Cultural Centre, in Lisbon, among others.

In the early 1980s Emanuel Pimenta coined the concept “virtual architecture”, later largely used as specific discipline in universities all over the world. Since the end of the 1970s he has developed graphical musical notations inside virtual environments.

He won the National Marketing Prize in 1977 by the Brazilian Association of Marketing; the APCA Prize in 1986 by the Art Critics Association of Sao Paulo (AICA Section in Sao Paulo); and the Lac Maggiore Prize in 1994 by the Lombardia Regional Government, the International Association of Art Critics, the Unesco and the Council of Europe, in Locarno, Switzerland. In 1993 his works were selected by the Unesco, in Paris, as one of the most representative intermedia researchers of the world.

He is member of the *SACD – Societ  des Auteurs et Compositeurs Dramatiques* in Paris since 1991. He also is an active member of the *European Environmental Tribunal*, in London, where he has been member of the board since 1995.

He is an active member of the *New York Academy of Sciences*, of the *American Association for the Advancement of Science* in Washington DC and of the *ASMP - American Society of Media Photographers*. He is member and advisor of the *AIVAC – Association Internationale pour la Video dans les Arts et la Culture*, in Locarno, Switzerland. He was a founding member of the *International Society for the Interdisciplinary Study of Symmetry – ISIS Symmetry* and the *International Symmetry Association*, both in Budapest.

He is member of the jury of the *BES Fellowship (Experimental Intermedia Foundation of New York, the Luso American Foundation and the Calouste Gulbenkian Foundation)* since 1995.

Mr. Pimenta has been frequently invited, as professor and lecturer, by several institutions, among then the universities of New York, Georgetown, Lisbon, Florence, Lausanne, Tsukuba, Sao Paulo, Palermo, the Calouste Gulbenkian Foundation, Monte Verita Foundation in Switzerland and the Technion Institute of Technology in Haifa, Israel.

He his founder and director of the Holotopia Academy, an institution oriented to music, art, philosophy and science, in the Amalfi Coast, Italy. He is also founder and director of the Foundation for Arts, Sciences and Technology – Observatory, in Trancoso, Portugal.

Emanuel Pimenta lives between Locarno, Switzerland, which is his main residence, New York and Lisbon. His site in Internet is [www.emanuelpimenta.net](http://www.emanuelpimenta.net)