# THE LOGIC OF CREATION:
# THE PHILOSOPHY OF SYSTEMS SCIENCES

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## INTRODUCTION

## THE 4TH PARADIGM OF SCIENCE: SOCIAL NETWORKS

*The Universe is a system made of social networks of complementary energy and information, which grow in scales of complexity from the simplest particles to the Universe - a network of informative galaxies and dark energy. In all scales of reality species are social, cellular systems, constructed with self-similar energetic and informative networks (fields and particles in physics; bodies and heads in biology), the whys that cause their existential cycles. In the graph: social dwellings of life superorganisms - insects and humans.*

### 1. The organic whys of the Universe; Systems sciences.

A simplex explanation of this work considers the meaning of knowledge and what questions it must answer to exhaust the study of a certain subject. In journalism we ask what, who, how, when and why.

In the evolution of science we observed first 'what' (experience) and then asked 'who'. It was the mythic age of science, the first paradigm of knowledge – when an anthropomorphic being, often a god was the cause of all events.

Then the Greeks used reason to ask the how of things, its causes and consequences. It was the 2nd paradigm of knowledge: logic thought.

The 3rd paradigm came with the arrival of machines that measured time and space: telescopes and clocks, which answered the 'when' of all events. It was the birth of metric geometries, when clocks equalized all the cycles of time of the Universe, by comparing them with the rhythm of a mechanical clock and put together all the fractal spaces of reality in a single, abstract Cartesian continuum, whose lineal time and space coordinates allowed to plot the data collected with machines and find certain regularities in the forms and cyclical rhythms of species, which were formalized by the laws of science.

The culmination of this process of mechanical measure came with quantum theory, which refined the measures of the cyclical trajectories of particles in the microscopic world and General Relativity, which refined them in the cosmological realm by correcting the deformations of those rhythms of time and distances of space caused by the limits of speed of our light-based Universe.

In philosophical terms, the paradigm of measure meant the birth of mechanism, the fundamental philosophy of our world today: the machine - no longer man, an organism - became the 'measure of all things'. This was a simplification, as today we realize that machines merely imitate our organs of energy and information with networks of metal-atoms (so a crane is an energetic arm of metal and a chip an informative brain of metal), which now we fusion into 'organic' robots. And so the change of paradigm from the Greek, Aristotelian and Asian tradition of organicism to mechanism is only a hiatus on a richer, more complex understanding of the whys of the Universe.

Mechanism changed also the language of understanding of the Universe, from Aristotelian Logic to mathematical Platonism, since mathematics was the language used by machines to measure the Universe of time and space with clocks and telescopes; while logic was the language embedded in the syntax of words, which measure time with causal verbs that describe the logic relationships between its 3 dimensions of past, present and future. So in terms of philosophy of science, mechanism meant a pendulum law that changed the paradigm from Aristotle (organic, temporal causality) to Plato (mechanical, spatial geometry). This choice was of course a wrong choice, because a truly inclusive theory of reality has to

put together both languages and approaches as we shall do in this work.

Because the why is by definition a causal, temporal process, the 3rd paradigm obsessed by spatial measure was not very interested in the why, as Feynman famously put it: 'the why is the only thing a physicist never asks'. And yet the why has always been the fundamental question of knowledge.

Yet scientists, not satisfied with the limits of the 3rd paradigm of measure kept asking the why, which could not be a personal God (the who of the 1st paradigm), neither the machine, the instrument of measure of the 3rd paradigm ('God is a clocker' said Kepler, because he used clocks to measure it and 'God speaks mathematics' said Galileo, because those machines translated the events of the Universe into mathematical data). The problem with those two approaches, which in fact are the same is obvious: a personal God is an anthropomorphic, subjective myth and science must be objective; while a mechanical view of the Universe still needs an internal, self-sustained process of growth, creation and synchronization caused by an external God that made and rewinds the clock - as Leibniz clearly stated in his critique of Newton. Scientists today are unaware that mechanist theories are in fact deist theories, reason why Kepler and Newton, pious believers, liked them; since they were a metaphor of their self-centered, anthropomorphic religious beliefs: If man created machines because we were made to the image and likeness of God, God had created the ultimate machine, the Universe.

Unfortunately such theories cannot satisfy the rational, objective, self-sufficient nature of science, as they require external myths to work. Thus if the why is neither God nor the machine, there is only a 3rd option in between - the organism, which is an intermediate concept; since an organism is self-sufficient as God is, yet it is part of Nature as the machine is. Such organicism means, as Aristotle, the father of this alternative to Platonic, mechanical science, well understood, a return to Logic - the understanding of the causal processes that move and transform organic systems from past to future – albeit a logic more complex than the single, unicausal logic of Aristotle. It also means, as he famously affirmed that we 'are all Gods' in an Aristotelian sense (unmoved focuses of informative perception that control and move the bodies of energy around them). That is, all what exists is structured with 2 complementary systems, one of information that gauges reality (particles and heads of physical and biological entities) and one of energy that moves them (fields of forces and bodies).

Further on, this duality of existential structures implies a perceptive, intelligent Universe in all fractal, self-similar scales of reality – a world in which even the smallest atoms can act-react to the environment, 'aperceiving' light and gravitational forces. Again, Aristotle and Leibniz, the 2 foremost predecessors of the 4th paradigm of biological whys distinguished conscious perception from vegetative and mechanical perception. It means perception has degrees of complexity. So the simplex particles of the Universe act-react in a mechanical way; yet they still gauge information, reason why quantum physicists called their theories gauge theories, and they still have 2 complementary networks of energy and information, reason why quantum physics is based in such complementary principle.

But there is more to it: when you combine properly the elements of an energy and informative network, you might also repeat, iterate, reproduce the social system. And so we talk of 4 'arrows of time' or dimensions of change that create the future: energetic and informative systems and events, which reproduce a wealth of self-similar beings that organize themselves into social networks, creating bigger wholes - new scales of reality. *And this simple game of complementary beings that in favourable conditions reproduce self-similar beings, self-organized into bigger social networks becomes the why of all realities*. Even the simplest particles, quarks of maximal

information and electrons of maximal spatial extension and motion 'decouple', reproduce, when absorbing energy into self-similar forms, and associate in complementary networks called atoms, made with a central informative mass of quarks and an energetic, electromagnetic, wider body of electrons.

So the ultimate why of the Universe is this causal chain of complementary beings that gauge information, feed on energy in order to reproduce and evolve socially into networks. *The creation of social networks, which have certain topological form, is the ultimate why of reality in all its scales:* social particles become atoms that become molecules that either become cells that become organisms that become societies or become planets and social stars that become galaxies that become Universes.

And all this can be described not only with the logic of organisms but also mathematically, because as Plato put it, 'numbers are forms', meaning that a set of self-similar entities are a number and so mathematics, the science of numbers, is by definition a social science. Further on those numbers create social networks with form: so 1 is the point, 2 is the line, 3 is the network and 4 the square and so on. Thus each number defines in geometry certain topological forms that favor certain flows of energy and information between the points of the network and we shall be able to reduce all those topologies of social numbers and networks to the canonical 3 topologies of a 4-dimensional Universe, proving that those 3 topologies have the properties of energy, information and reproductive events.

The reality this new approach shows is one that is never static, because geometry becomes topology; planes and forms become networks and distances become flows between points, which can be described with feed-back equations, E⇔I, no longer with equalities. But once we grasp those dynamic principles and upgrade the static, Aristotelian logic and geometry used in the 3rd paradigm to obtain measures in a 'fixed' single space-time continuum and loose our fear to describe a universe of multiple 'feedback' time cycles and broken, 'vital spaces' the rewards will be many solutions to problems of all sciences unresolved in the 3rd paradigm.

Thus 'complex organicism' goes beyond the dual philosophies of Aristotle and Plato and fusions them together, using the last discoveries of mathematics (fractals and non-Euclidean points) and system sciences (the study of networks, its units, time cycles described with feedback equations, its social knots and topological forms). As such it is a philosophy of science aimed to substitute the anthropomorphism of religion and the limits of inquire of mechanist science, mature enough to give the answers to the whys that neither religion or physical measure could give; and can be summarized in a sentence: *the creation of organic, social, self-reproductive, complementary networks with energy=motion and in/form/ation that become cells of higher wholes, evolving from the simplest particle to the entire Universe.*

In that regard, this new philosophy of science has a name: system sciences, the science of networks of information.

System sciences were founded at the death of Einstein in the Macy's congress 50 years ago under a new principle of philosophy of science that was meant to substitute mechanism, called organicism, as it was understood that all what existed was a system or network of self-similar beings and those networks were the principle that structured all organic systems. It also added a 2nd arrow of time or 'primary substance' in the study of the Universe – information, which being fractal, discontinuous and non-differentiable had not been properly mathematized in the previous paradigm.

This trendy word, which today is in the mouth of most people, due to the development of information machines, is however misunderstood in its deeper meaning as form, due to its earlier definition by physicists, precisely in the field of computers (Shannon), who defined information merely as a stream of mathematical data. In/form/ation in Nature is a

wider concept carried by all types of dimensional 'forms' and languages: in physics information is carried by the forms of waves or the rotational frequency of masses and charges; in biology by the dimensional warping of DNA and protein molecules; in social sciences by the form of words and art; and so on. Dimensional form is in fact one of the two essential variables that creates reality; along with 'energy', also a wider notion in Nature similar to the concept of lineal motion, speed or expansive entropy. For that reason we consider energy=lineal motion=entropy and information=cyclical form, the two components of all systems of reality.

The mathematical difficulties to formalize information beyond its one-dimensional analysis by Shannon lasted till the discovery of fractal mathematics by Mandelbrot and the completion of Non-Euclidean mathematics by this author, with its definition of a fractal point 'with parts', the self-similar unit of all networks of the Universe[1]. Once those 2 steps have taken place, finally we can construct a proper formalism for all systems made of networks, which I introduced at the 50th anniversary of the foundation of Systems Sciences at the International System Sciences Congress at Sonoma.

In this and the following lectures that I hope to give as chair of Duality (the science that studies of Complementary Networks of energy and information) in the ISSS annual congresses we will explain in more detail the logic and mathematical formalism of all systems of energy and information and apply it to the 3 main disciplines of sciences, physics, biology and social sciences, to show the unity of all universal entities, solving most of the questions and whys left unanswered by the 3rd paradigm of metric measure.

In that regard, the 4th paradigm improves both the empirical, mathematical solutions of science but especially the logic concepts that the paradigm of metric measure, obsessed with digital machines, brushed aside and now regain importance. In this lecture, dedicated to the philosophical principles of duality and systems sciences the explanation of the meaning of words like time, space, dimensions, information, energy, motion, mass, universal constant, society, organism, machine, network, wave, light, point, etc. which were not key questions of the 3rd paradigm, will occupy many pages; as information is not only carried by numbers but also by logic words, better suited to describe qualities and properties ill-translated by numbers. And only, when those concepts are fully understood in its complexity we will be able to explain the laws of time and space, systems and networks and provide detailed examples and solutions to those sciences.

The why of the Universe is a social, organic, reproductive why: the Universe reproduces information and organizes forms socially into networks: From magnetic and electric fields, made of magnetic and electric constants that mix and reproduce a light wave to fundamental particles, quarks and electrons that absorb energy and reproduce new quarks and electrons, to energetic males and informative females that reproduce together, all in the Universe can be described with that simple scheme of things, which can be as detailed as needed to connect it with the 3rd paradigm of metric measure of those networks, its motions and forms.

All those systems, their mathematical and logical formalisms, the ternary plan of creation and evolution, they follow; their symmetries in time and space, its ternary topologies (since there are only 3 topologies in a 4-dimensional Universe, which correspond to energetic, planar networks; informative, hyperbolic ones and toroidal, reproductive systems) and the study of its Feed-back, generator equation, which formalizes them all with the tools of fractal, non-Euclidean geometry, form the 4th paradigm or why of science.

Yet the reader must be aware that such paradigm implies a completely new philosophy of man and the Universe, more proper of Eastern traditions than Western, anthropomorphic, self-centered thought. Organicism substitutes mechanism;

duality of energy and information substitutes monism (a single arrow of entropy or energy), form becomes more important than motion, the social network more important than the individual and life a better model than the machine. It also has deep implications for our praxis of science and policy, since on one side it puts man again as the measure of all things – the more complex organism of information known to man – and so it vindicates the importance of biological and social sciences over physical ones, ushering a warning to mankind, which is obsessed by the technological evolution of machines, forgetting the need to evolve humanity at social level and to take care of the life ecosystem developing a sustainable economy. Since it turns out that machines – organisms of metal – follow their own path of evolution as an independent species, which we men merely assembly, following the laws of evolution of all organic systems. Hence, we are now building, after making energetic bodies of machines in the XIX c. and informative heads (chip-brains, mobile-ears and camera-eyes) in the XX century, organic, robotic machines in the XXI c., which are competing with us as a new species in labor and war fields and could easily displace us as the top predator species of this planet by the end of this century.

The 4th paradigm is thus not only a theoretical advance in our knowledge of the Universe but also as science has always been, a tool to improve the future of mankind, which faces in this century challenges originated by the 3rd paradigm and its worship of machines of measures, largely ignored by the cult to the machine the 3rd paradigm caused.

The content of this work, which tries to give an overview of the philosophical and mathematical foundations of the 4th paradigm and its application to the 3 main bodies of human sciences, physics, biology and sociology, is divided accordingly in 5 lessons which I will give in the ISSS congresses of Tokyo, Madison and Waterloo. Together and in the order given they formalize the 4th paradigm as a General Systems Theory of Complementary, Dual Networks of Non-Euclidean Points of energy and information, the 2 simplex Times arrows, whose complex, reproductive combinations, exi, and social evolutions, ∑exi, suffice to explain all the events and forms of the Universe:

*Lesson 1: The Philosophy of General Systems Sciences.*

In the first lecture that follows this introduction, we explain the structure of the Universe made of self-similar networks of energy and information, which are the 2 components of all the complementary beings that 'exi=st', constantly evolving into more complex systemic networks, which become units of bigger wholes, building the scales of the fractal Universe, from the simplest particles that become parts of atoms that become parts of molecules, parts of cells, planets and stars parts of galaxies, parts of Universes.

*Lesson 2: Fractal Universes.*

In this lesson we formalize the philosophy of General Systems Sciences with the advances of fractal and Non-Euclidean geometry. We first resolve the 5 postulates of Non-Euclidean geometry, which define all beings as 'points with parts', able to process energy and information; all lines as flows of energy and information between points; all planes as networks of n-points connected by energy and information flows and departing from those structures we deduce the mathematical laws that all complex systems made of multiple networks and extended through different scales of size, follow. We illustrate those laws with examples, and use this formalism in the following lessons to resolve and complete the metric models of physics, biology and economics, which now find their why in the structure of networks and systems, their 3 ages of evolution, its 3 basic topologies and the laws that all networks follow derived from the 5 postulates of i-logic geometry.

*Lesson 3: Complex Physics, the arrow of Einstein.*

Classic physics drags many errors derived from its definition of space as a continuum and the future of time, born out of a

single arrow of entropy and energy. We introduce the model of duality with the arrows of energy and information and the model of multiple spaces, to define a complex Universe made of the interaction of 2 different membranes of spatial energy, the light-membrane and the gravitational membrane, and 2 arrows of time,, the arrow of entropy and electromagnetic energy and the 'arrow of Einstein', the cyclical, broken vortices of mass and gravitation that attract and in/form the physical Universe.

*Lesson 4: Duality in Biology.*

We study Biological structures and the evolution and differentiation of species in systems specialized in energy and information, such as gender or body/head systems with the laws of Non-Euclidean topology and the two arrows of energy and information. Since evolution follows the 3 'ages' or horizons of energetic, young species, mature, reproductive radiations and informative, 3rd age of diversification in time and its 3 parallel topologies in space – the hyperbolic, informative topology of brains and DNA nuclei, the toroidal, reproductive topology of body organs and the lineal topology of energetic limbs. Thus we unveil a guided plan of evolution that completes the work of Darwin and Mendel.

*Lesson 5. 72 years cycle of evolution of money and machines.*

The application of duality and systems theory to economics unveils a biological model of evolution of machines of energy and information with a series of 72 years cycles of evolution of energy machines, information machines and now robots, with extraordinary consequences for the future of mankind. Since economics is a biological discipline, in as much as machines its main produce are systems that imitate our human organs of energy and information.

*Lesson 6. The superorganisms of history and economics.*

We complete the Introduction to a Dualist model of system sciences with the study of the 2 superorganisms that are being created on planet Earth: The superorganism of human beings that we call history and its smaller super-organisms, (civilizations) and the FMI complex, the superorganisms of money, weapons and machines of metal, called the economy, which develop in a mutual process of symbiosis and competence.

Those 6 lessons which I hope to give in the different congresses of Systems sciences during the next years complete the model. If the reader is interested in the whole, even if we give brief introductions in all those lectures with the basic concepts of the model, my advice is that he tries to read the lessons in the order they were given, as it will be difficult to understand the model without reading lesson 1 and 2, which explain the logic and mathematical foundations of the 4th paradigm. [1]

*Recap*. The Universe is neither born of a personal god (1st paradigm of knowledge) or a mechanism (3rd paradigm of science) but an organic, complex system of networks of energy and information, whose self-similar points evolve socially from its simple particles to the more complex organisms and cosmological entities. The organic, 3rd paradigm of science and the understanding of its main cause, information, has developed enough to be able to describe all those systems, its parts and organic laws with great detail, solving many unanswered questions about the whys of reality.

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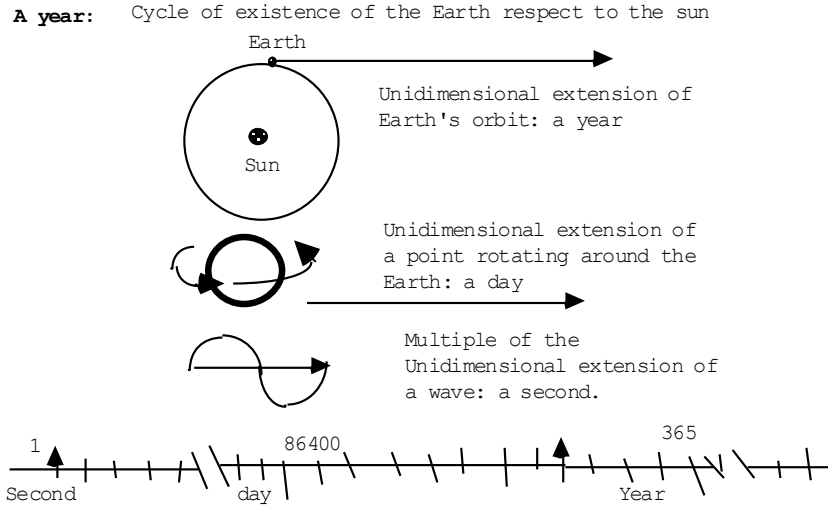
[1] The complete model published in Spain in the 90s under the title 'Los ciclos del tiempo' Editorial Arabera will be published in America, sometime in the future under the title 'The 4th paradigm of science: social networks' in i-Universe books. The lectures should be found in the servers of ISSS.org and some of them in Google scholar under my name.

## I. MANY CHANGES OF MULTIPLE SPACES&TIMES




*In the Universe there are infinite discontinuous time cycles, in which a certain entity displays a cyclical motion, even if we equalize them, comparing their rhythms with those of the time cycle of a mechanical clock. A theory of multiple spacetimes goes beyond a quantitative measure of those cycles, explaining the causal, logic 'whys' that drive entities to trace them: Those space-Time cycles are geodesics traced by the ∞ species of the Universe, which in search for energy and information imprint a surface of space leaving behind the patterns of in-form-ation and space-time cycles, we perceive in Nature. Thus each entity of reality is a knot of space-time cycles, whose purpose is given by their existential will – their desire to gauge information, feed on energy, reproduce their form and evolve socially – the 4 fundamental 'arrows' that become the why of those cycles.*

### 2. Time is Change.

Science is the search for answers about the 'future' - hence directly concerned with time=change as its primary subject of analysis. Scientists learn what will be the position, energy and form of certain species in the future – how the species will change – according to self-similar events that happened in the past; and they call those regularities scientific laws. Thus, scientific laws can be considered the extrapolation into the future of cyclical regularities found in the past, on the modes of change of every entity of the Universe.

Scientific Laws make Time and the causality that relates past and future events the most important theme of philosophy of science – a discipline, which is, despite its relative obscurity, the summit of scientific thought. In that regard, the 1st fact we must re-address to evolve our philosophy of science is a wider understanding of time=change - since there is a philosophical meaning of time as change, different from the mathematical concept of time as 'what the clock measures' - *A. Einstein*[0].

To differentiate those 2 types of times - the wider, philosophical concept and the restricted, physical one - we shall call the philosophical concept, time=change, and the restricted mathematical concept used in physics, clock-time.

In philosophy of science, time is the perception of *any* type of change, most likely a change in the form of beings (biological time, as in evolution or in the life/death cycle) or a change in the motion of beings (physical time, measured by clocks as in Galileo's formula: V=s/t). So Time as Change studies together all time-related changes in all disciplines from Biology to Physics. In physics the instrument physicists use to measure time, a clock, becomes essential to model all times-changes similar to the clock's rotational frequency, a 'cyclical geometry' of space. Time then becomes synonymous of cyclical trajectories – a geometry of space – and the Universe becomes a game of clock-like motions – the description of all those trajectories:

'God waited 6000 years to find an intelligence like His, to understand His clock-work', *Kepler*[1].

This geometrical concept of Time, which appears with the use of clocks and advances with the work of Galileo and Kepler, is properly formalized in the work of Einstein in which time becomes associated to the spatial geometry of 'clock-time

cycles' - the curved 'geodesics' of Relativity physics. We talk thereafter of the geometries of space-time. Thus the physical concept of clock-time is of great interest to understand the cyclical paths and trajectories we find elsewhere in the Universe, mainly orbital bodies and orbital particles, cyclical masses and charges. So Einstein says that Time is a geometry and 'time curves space' into cyclical, clock-like masses. Indeed, all those particles behave like small, cyclical clocks, which can be modeled comparing them with our mechanical clocks. And so in Relativity Physics we get a very detailed analysis of a specific type of change – the clocklike motions of physical particles that change their position in space.

Fair enough, but this is a restricted analysis of *all* the times= changes of the Universe, which are studied by many sciences besides physics, all of which use the concept of time. Thus, while it is important to study physical motions=changes in space, it is absurd to think -as so many ill-informed people do- that time is 'just' a geometry of space, the '4 dimension of space'. Since this restricted concept of time-change doesn't study other types of changes, like those in the form of beings (biological change). This is a grave defect because we, humans, are biological beings, who experience time mainly in a biological form (through changes in our morphology, from life to death), *not* as particles do, mainly by moving at high speeds. We never move at light speed as the particles studied by Einstein did, and so most findings of Relativity about time are irrelevant to human 'time', which is mostly about morphological, informative change. This was already understood by Aristotle, who talked of 2 types of time-changes, informative/morphological change, studied by Biology and physical, translational change, studied by Physics. And that duality between 'changes in the form, the in-form-ation of beings', and changes in the 'energy, the motion of beings', still stands, defining 'energetic change' and 'informative change' as two primary modes or *Arrows* of time-change.

Thus, we need a philosophy of time=change that goes beyond the study of the geometrical, spatial motions and orbital cycles of physical particles to include at least biological/informative time-change. And to do so, it is needed to incorporate verbal, logic concepts of change, as Theory of Evolution, the main theory of Time in Biology, does.

Let us then forget for the 'time being' the restricted, physical concept of clock-time, defined by Galileo as v=s/t, a measure of the change in the motion of beings, and think about the intuitive, verbal, wider concept of time as change. Time is then defined as *the perception of change.* And the science that studies the causality of all types of time-changes is called logic, which tries to order those different types of temporal change.

Unfortunately the dominance of clock-time - the use of a single language and instrument to measure all the types of time-change of the Universe - has restricted in the last centuries the understanding of the logic of time, reason why we need to disengage from the dictatorship of clock-measure and upgrade our time analysis with the language of logic, the supreme language of all modes of time. And therefore *a language that includes also the language of mathematics, in the same manner time-change includes clock-time*. Indeed, if mathematics derives from logic – a fact proved by Frege and Gödel[2] in the XIX and XX centuries, and by every computer which uses logic circuits to do mathematical calculus – we will prove in this work that clock-time is a partial case of time-change.

*Recap*: Time is change. Physics is dedicated to measure particles and forces in space and time with the restricted concept of 'time-clock' – the study of change in the cyclical motions of beings with an instrument called 'the clock' and a single language, mathematics. Logic is dedicated to the wider analysis of all types of time-changes, with all types of instruments and languages. It follows that the Logic definition of Time as change is wider and more important for a General Theory of Time than the Physical definition of time-clock.

**3. Cyclical Time arrows and scientific laws.**

Because the unit of time-change is an 'event', the way to do time science with logic is to classify all observed events into a series of basic types of change, proper of each species of reality – what we call 'laws of science'. Those laws show in detail the changes of some entities under certain events, which will allow us to predict in the future how self-similar entities will behave.

A more generalizing way to do Time science is to relate self-similar events that happen in many different species and try to extract in this manner more general events or Laws of Science.

We can search then for wider and wider Laws, which collect more and more events of change, to define more 'fundamental categories' of Time-Changes in reality (even if we lose some precision in that search of wider types of change). In this manner we will find the widest types of Change. Each of those types of change will relate an enormous amount of similar events in all the species of the Universe, till extracting an absolute type of event/law of science – called in philosophy of science an arrow of time - that will help us to understand the Future Types of Change of the whole Universe.

In that regard, the difference between a 'philosophy of science' and a 'detailed scientific analysis' - a paper about certain events of the Universe - is clear: While both draw from experience and search for general laws, the approach is the opposite. In a philosophy of science the search is for the most general laws and events that happen in the Universe, the big whys from where to deduce the smaller whys. In day-to-day practical science, those questions are not required as long as we have a particular law to define a specific type of event; so we lose generalization but we win precision. Unfortunately today we have little research on the ultimate questions, since what we have evolved more are our instruments of analysis of the details of reality *not* the human mind that synthesizes that knowledge. Such synthesis is achieved only when we find the widest of all types of change – the final arrows of time or generic types of change that become the fundamental events of Logic, the science of causality in time.

Causal arrows of time are important; because if we are able to define the key arrows of causality or modes of time-change, we can forecast an entity's future when we observe a certain event A that will trigger a certain result B. This is the ultimate goal of all sciences: The chemist needs to know how a chemical reaction will develop, according to a certain type of A->B event already observed in the past; the astronomer knows where the sun will be, according to the orbital cycles it displayed in its past time. So a Theory of Multiple Time Arrows act as a general guide to classify the actions of beings; but its fundamental importance lays in its capacity to explain for the 'first time' the scientific why of reality – not only the how of those space-time trajectories provided by clock-time, but the reasons why events happen, why birds feed, planets turn in orbits, space-time has dimensions, waves collapse into particles, etc. Since all those motions and events of change will be ascribed to a General Arrow of Time. In this way, *the why of the Universe becomes reduced to explain 'why' those arrows of time exist,* what are their properties, the relationship between them, and what their existence tells us about the purpose of the Universe as a whole and the purpose of all its parts, which obey the direction of future signaled by those Time Arrows.

*Recap*: The Unit of Time-change is an Event. Science is the search for generic, causal processes of time-change - called scientific laws - that explain a big number of events and can be applied to many similar species. Those causal relationships will be then repeated when the initial conditions are met, allowing mankind to understand the future events of those species submitted to a law of science. 'Time arrows' are the most general of those scientific laws and hence the 'units' for a General Philosophy of Science. There are 3x3 time arrows in the Universe.

## 4. The relative truths of different complex time theories.

When the question of how many types of Time Arrows exist is put forward, the easiest way to go is to think there is only a fundamental type of change/arrow that includes all other types of changes or 'events' in the Universe.

Physicists do this when they talk of 'entropy' - the constant increase of energy/motion; hence of disorder observed in many physical entities of the Universe - as the single arrow of time. Latter we shall see this simplification is due to the simplifying limits imposed on physical time studies by the only-use of clocks and classic, Euclidean mathematics, which are not very good tools to perceive the 'form' or 'in/form/ation' of beings.

Single, Monist theorists of time are also common in Religions that consider an entity called 'God (to be) the final cause without further cause', (Saint Thomas[3]).

But these kinds of theories are meaningless and full of errors and simplifications, since as Parmenides proved from 1 not even motion can arise. Or as Einstein said, 'the Universe is simple but not the simplest'. And we shall show many of the errors of physics caused by single-entropy only theories.

Complex, Dualist theories, from Taoism to Biology, consider at least 2 arrows or 'Gods=Wills of Times', energy=yang and information=yin, as the ultimate events-causes of change. In Hinduism the arrow of energy is impersonated by God Shiva and the arrow of information by Vishnu - in Taoism by energy =yang and yin= information. While in modern times physicists translate the energy arrow with the concept of entropy and biologists study the arrow of information as the origin of life.

So Dualist theories are good enough to analyze multiple phenomena and according to the Principle of Equivalence that validates a theory of science even if it is not complete, as long as it can explain a set of events of reality, we consider dualism, as the 2 initial 'elements' from where more complex theories can depart, and call those 2 arrows the simplex arrows of time.

Finally, the Bible considers also the existence of the reproductive arrow (And God said 'grow and multiply') and the social arrow ('Love each other as I have loved you'), which can also be found in many other religions. So, for example, Buddhism talks of Love and Taoism says that from the 'combinations of yin and yang, 10.000 beings are reproduced'. In that sense, religion is the study of God, the creator of Times, the mind of the Universe, which we shall now explain in more detail with the Generator Equation of Times, the mystique God of Science. But it is a biological God, or rather we are as Aristotle said all Gods.

*Recap*. We are all self-similar parts of the whole, biological beings, super-organisms with its same behavior and form, playing the same game of existence - a game that we shall call God: The game of life and death. The cycles that create a being and destroy it and the process of creation of its networks and destruction of them, at any scale from the infinitesimal to the infinite, the game we shall describe in this work. And indeed, those 2 arrows are used by biologists as the drives of existence of most living beings.

## 5. The ternary differentiation of time arrows.

Thus, there are different theories about the number of arrows of time that exist in the Universe and different disciplines which study different arrows, and also different languages (verbal, visual and mathematical languages) to describe all those arrows of times-changes. Yet an exhaustive analysis of all Time theories of religion, science and philosophy shows that we can classify most events in time within 4 categories of time events - *energy, information, reproduction and social evolution* – which become the 4 'whys' that explain all the cycles, behavior, motions and events of reality.

What we shall do in this work is use those 4 arrows to explain most phenomena, and then refine the analysis of the details of the Universe by differentiating some of those arrows in new dualities. For example, social evolution is different among energetic 'species' which form only waves with minimal communication and informative particles, which form

networks. Finally in the Universe processes of social evolution are multiple and fractal so atoms become molecules that become cells that become organisms that become societies and so we have to consider those fractal scales of reality and define a fractal or transcendental arrow. This means we divide the social arrow in 3 different sub-arrows of time, for a total of 6.

On the other hand the arrow of reproduction can reproduce a simple action or 'minimal cellular' event that combines energy and information, exi, which is used in physics; or it can reproduce a far more complex social organism till recreating the entity, e⇔I, which is the arrow of reproduction proper and as a result of this, when multiple reproductions happen in time, it gives birth to a series of generations between the birth and extinction of a species, and so we can divide in 3 sub-arrows the arrow of reproduction, for a total of 8.

Finally, if we take the entire Universe or any of its worlds or ecosystems as a whole, it is obvious that we can consider this final teleological goal of creation that puts together all the parts of a set into a whole, the 9th and final arrow, which defines the absolute space-time, EXI, of reality and exhausts our analysis. So the total arrows and dimensions of the whole Universe are 9 - the maximal arrows of time we shall use here.

*But in this introductory course we shall use basically the 4 biological arrows that suffice for a detailed analysis of reality: the arrow of energy feeding, informative perception, reproduction and social evolution.*

Consider what you do as a human being with your lifetime, and try to put your events and actions within those 4 categories: All family events relate to reproduction. All feeding events relate to energy. All social events relate to eusocial evolution. Your work events relate to the accumulation of money, the 'language of economical reproduction' that allows you to acquire the energetic and informative goods your reproductive body and informative head require. When you drive you are in an event that converts energy into motion. When you read this book or watch TV or surf the Internet, you are accumulating 'information', albeit expressed in different languages, made with different 'formal symbols'. At the end, you will not find any action that does not become explained by those 4 arrows. And since you are in fact, as a human being, the most complex 'form' of the Universe, it is easy to deduce that all other simpler species also perform events related to those 4 arrows.

For example, Physical matter & space can be described with those 4 arrows: We know that the simplest physical beings – particles - gauge information (so quantum theories are called gauge theories), absorb energy (called forces), reproduce into self-similar particles (so quarks and electrons produce self-similar quarks and electrons when you give them energy), and evolve socially into atoms, molecules and celestial bodies. So the two limits of simplicity (atoms) and complexity (human beings) we know, do follow the main Postulate of the Theory of Multiple Spaces-Times – that the Universe can be explained departing from the study of the properties of those 4 main arrows of time.

This self-evident truth however is hidden to science due to the religious traditions 'subconsciously' embedded in the *work* of the founding fathers of science, mostly pious physicists of the Jewish-Christian tradition, for whom there was a single, monotheist God. And so, when a Philosophy of science was devised by those 'founding fathers', it became natural to seek for a single arrow of time that matched the Christian beliefs of Kepler, Galileo, Descartes and Newton[4]. The choice of arrow was thereafter defined by the nature of Physics: since earlier physical studies were based in clock-measures of the motions in space of physical particles, expansive motion=energy= entropy has become the single arrow of modern physics. Yet entropy-only models ignore the arrow of information, of morphological change that defines life. In that regard, there are in science two theories of time, which this work fusions and upgrades into the more complex knowledge about

mathematical and logic languages and complex natural phenomena (fractals, chaos theory, black holes, cyclical time, information sciences, etc.) proper of the XXI C:

- Theory of Evolution, the Biological Theory of time developed by Darwin, based in causality and logic time, according to which Time evolves the in/formation, the form of species. Since the causality of Time is based in the extinction of the less perfect morphologies of the Universe, whose form is destroyed and used as energy for the future reproduction of the best forms

- And Relativity Theory, in which the analogy of Time-clocks is taken to its ultimate consequences, defining times as a 'curved geometry of space', self-similar to that of clocks.

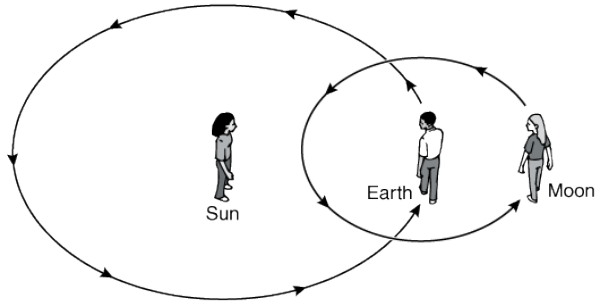
This work unifies both Time theories into a single scientific theory of time=change, by expanding the Einsteinian concept of a curved geometry of time events, which are 'cyclical in nature', as the time cycles of the clock, to biological sciences; and the concept of the survival of the fittest 'forms of time', proper of biology to physical particles, where species with maximal momentum survive.

Thus the ultimately surprise of the new paradigm is that you live in a vital universe because the 4 arrows just described are the 4 properties biologists call the drives of life. Indeed, the Universe is made of infinite number vital, fractal, topological space-times that live, exist through those arrows.

Yet a Multiple Spaces-Times Theory goes beyond Evolution Theory, which studies the Time Arrows of Information and Reproduction and Physics, which studies the Time Arrow of Energy, to include also the Time Arrow of Eusocial Evolution, especially relevant to understand Religion and History.

*Recap*. The 4 biological arrows define not only the will of life but the will of all systems of reality: the arrow of energy feeding, informative perception, reproduction and social evolution.

## II. SIMPLEX ARROWS: ENERGY ⇔INFORMATION. THE GEOMETRIC BEAT OF THE UNIVERSE




*Why the Earth moves if human beings see it still? The answer to the Galileo's paradox is fundamental to understand the duality of all systems that have energy and information, motion and form. Yet our relative point of perception will observe only one of both states of the being.*

### 6. E pur si muove, e pur no muove: Galilean Paradox.

What is reality, static form or motion? The answer is both. Yet this duality, origin of an enormous number of phenomena in the Universe, from the Complementary Principle of Quantum Physics to the reasons why you can see a movie, is still misunderstood by monist science… We call it the paradox of Galileo because Galileo rightly found the Earth was moving when it is perceived as still, but he forgot to ask the right question: why we see the Earth quiet when it is moving? Galileo didn't realize of that contradiction, inaugurating the Philosophy of science sponsored by physicists, called 'Naïve Realism'. This paradox never answered by science is the first question we must explain to fully grasp the meaning of reality. Because if all is motion, if all is events in time, we exist in time NOT in space. Space is submissive to time. We exist in time-space, where the dimensions of space are just 'motions of the energy of vacuum, perceived as static forms'. So in cosmology the expansion of the energy of vacuum is perceived as galactic motions. Once the existence of motion in every entity of reality becomes clear to the observer, a r=evolution in our way of

perceiving reality, like nothing that has happened since Galileo, takes place. Since motion - no longer substance - is the primordial content of all realities. All what exists is a motion in time. Yet we perceive some of those motions as static space, since we perceive simultaneously a minimal 'duration' of time, making 'still photographs' of the length of those times cycles and motions as if they were trajectories that occupy space. So we see cars in motion as lines of space in a night picture and the Saturn's orbital planetoids as cyclical rings.

Perception puts together lineal and cyclical motions into a series of static forms that extract motion from universal entities *to fit their information into the limited 'space' of the mind*.

*Recap*: All what seems static in a 'naïve' perception of reality has motion, when observed in detail. Hence we exist in a Universe of 'motions, of events in time', not of 'substances that occupy space'.

**7. Inversion Laws of energy and information arrows.**

Aristotle defined 2 types of time=change in the Universe, translational change in space, which physicists study, and biological, morphological change in the information of beings (evolution and life/death cycles). Those 2 types of change are the 'arrows of energy and information' of a Universe made of 'time motions', in which the 'forms of space' are merely 'still photographs' of those flows of times. All what exists are those two states or elements, motion and form, which are equivalent to the abstract concepts of time and space. Yet since, according to the Galilean paradox, all forms have motions, we exist in a Universe of infinite motions that are often perceived as static forms of space. And so the true differentiation of reality must be made between lineal motions that occupy extended space, and we call lineal energies, forces or 'motions'; and cyclical motions that implode space, creating dimensional form, which we shall call cyclical in/form/ations or time-clocks. Thus, the 2 primary arrows of future in the Universe are the creation of energy=lineal motion and information=cyclical motions with more dimensional form. Yet the properties of those 2 geometrical motions are inverted. *Those Inversion Laws are the fundamental Laws that related both simplex arrows*:

| *Informative time, Ti* | *Vs.* | *Energetic Space, ΣS* |
|---|---|---|
| Time-clocks:Information | Vs. | Space motion:Lineal energy |
| Small, still | Vs. | Large, moving fast |
| Tall, Perpendicular | Vs. | Long, Parallel, |
| Hierarchical | Vs. | Democratic |
| Bidimensional Height | Vs. | Bidimensional, Length, |
| Repetition | Vs. | Width-Growth |
| Cyclic, Rotation, imploding | Vs. | Lineal, uncoiling, exploding |
| Informative Frequency | Vs. | Lineal Speed |
| Broken form | Vs. | Continuous, differentiable |
| Intelligent, perceptive | Vs. | Strong, fast. |
| Social, organic, creative | Vs. | Darwinian, destructive behavior |
| Future, evolved predator | Vs. | Past, energetic victim |
| Life arrow | Vs. | Death arrow. |
| Waves of space | Vs. | Particles of Time |
| Female, yin principle | Vs. | Male, yang principle |
| Masses, charges | Vs. | Forces, fields |
| Heads & senses | Vs. | Limbs & Bodies. |

To create cyclical information we warp lineal energy into bi-dimensional form and vice versa - we can create energy by uncoiling bidimensional clocks of information, expanding its shape into lineal space. This dual event can be generalized to 3-dimensional spheres, which 'explode' into bidimensional 'sheets' of lineal space-energy ($E=Mc^2$). And vice versa: the formless, lineal energy of gravitational and electromagnetic forces that fill space can be trans/formed into forms with a cyclical clock-like shape, called a mass or a charge. The meaning of information is form, which stores patterns that can be memorized, reproduced and imprinted. And since form is dimensional, the information a system carries is proportional to the number of dimensions it has:

*Information:* $v^D$

This distinction is important because humans defined Information (Shannon) in its simplest dimensional form – a lineal wave with a frequency V – useful for the simple 'computer machines' we use to store information with only two digits, 0 and 1; yet the Universe stores dimensional information in more complex volumes (bidimensional vortices of mass; 3-D electronic systems; 3 dimensional DNA, hyperbolic structures, convoluted brains etc.); such as each dimension stores a level of information and only adding all the scales of form, we can calculate the total information of a system

Thus, we can study those 2 types of events or Time arrows, according to the Duality of the Galilean paradox, as changes of motions or changes of forms, from static lines into cyclical, broken shapes. Yet the mathematical tools we use to describe those 2 types of Time Arrows differ: Since lineal energy is continuous and so we use differential equations to describe energy; while cyclical, closed information is discontinuous, breaking space-time into an inner and outer region - so we need to use discontinuous, fractal mathematics discovered in the past decades to study the creation of form – reason why most physical studies ignore information, since the mathematical description of its properties was not available till recent.

In the verbal age of Science, when men used words to describe the Universe, philosophers called the 2 arrows, Yang-energy, synonymous of male forms (since men have a lot of energy, constantly move, control space and have lineal forms) and yin, related to cyclical time and its patterns of information, which became the female principle (since women are more perceptive, informative, memorial, ordered, made of cyclical curves). Taoists said that yin=form, in/form/ation, which they represented with cycles or fractal lines, - -, and yang=energy, which they represented with a continuous line, ___, combine into yin-yang forms, and further on into ternary sets, which they represented with trigrams (I Ching), giving birth to all the possible forms and events of the Universe. In Hinduism the 'wills of time' were represented by Shiva, God of death and energy vs. Vishnu, God of life and creation.

Duality has always been present in philosophy. Parmenides proved beyond logic fault that from one only one could be created, while 2 could combine themselves into infinite new forms. Heraclites said that 2 elements are necessary to generate by iteration and combination all other forms of the Universe. On the other hand, dialectic philosophers, from Heraclites to Hegel, considered that from a thesis and an antithesis arise all synthetic forms.

- In the modern age, when mankind switched from verbal, temporal languages to mathematical, spatial numbers, in order to describe with higher accuracy the Universe in Space, scientists stressed that formal, geometrical duality of reality. Desargues, a French mathematician, found in the XVII century that all curves and functions could be extracted from the combination of 2 Generator forms, a cycle and a line (that together create a cone, from where those curves, called conics, could be extracted). The father of Western Science, Descartes, also said that the Universe was ultimately made of 'res extensa' (lineal space represented by his Cartesian graph) and vortices of form (charges and masses), similar to time clocks. String Theorists reached the same conclusion in modern science, postulating that all particles are made of lineal and cyclical strings, described by the Beta function. And Einstein in his General Relativity Theory deduced that the Universe was a flat surface of energetic, spatial forces that time curved into cyclical masses, the 2 fractal units of the physical Cosmos. Thus, time and space are geometrical shapes closely related to each other, since cycles of Informative Time bend any plane of Energetic Space, creating the geometrical duality of the physical world. Moreover, those 2 geometries are irreducible to monism, as the ancient problem of squaring the cycle proves.

- In any logic language 2 symbols suffice to represent any being of the Universe. All languages have a syntax based in 2

parameters, one of information and one of relative energy that combine through a 3rd active principle, an operandi or verb, that merges them. We talk of a *ternary Universal Grammar:*

*A (Informative subject) <Operandi/verb> B (energy/object)*

This ternary, Universal grammar applies to all languages and codes able to represent the time cycles of reality: from the code of colors (red that represents energy, blue, the color of information and green, the reproductive color) to verbal languages, where an informative subject relates to an object through an exchange of energy and information, described by a verb, shaping the genetic structure of all human languages (Chomsky[8]). It also happens in mathematics, where f(x)= g(y) is the universal equation that summarizes all the others.

- Computer Logic is also based in 2 elements: the symbols of the cycle and the line, 0 and |, related by an algorithm. Those digital symbols are not ordered in space as geometric elements, but sequentially, in time, since logic is a time language. Yet they can model any mathematical, spatial relationship, showing the primacy of time over space.

- In Physics, cyclical and lineal movement, gravitational vortices and lineal electromagnetism, cyclical particles and lineal forces, are the only 2 shapes necessary to explain the material Universe. And such duality is irreducible to monism, as the failure of all Unification Theories of forces show.

- If we grow in scale into the biological world, the morphological invariance of both substances is maintained: Time has evolved masses of undifferentiated cells into complex living organisms, which are also made of cyclical heads that store and process Informative Time and lineal limbs of energy. Another less pronounced energy/information duality is between reproductive body, which absorbs energy to reproduce the cycles of the organism and delivers part of it to the limbs and the informative head:

The head is a cyclical, spherical form, and so are the informative senses, all of which accumulate in the head. The head is 'small', 'perceptive', informative. It sits on top of the body, on the dimension of height. It is 'broken, discontinuous' (as it holds more cellular, neuronal parts that the rest of the body'). The head is hierarchical and dominates the body, imposing its directions of future as they guide their body towards energy and information fields. The head is still. It is in metaphysical terms, the Aristotelian, unmoved 'relative God' that controls the movements of the body.

Its senses also show the same duality: the main informative senses are broken in dual elements (left, right eyes and ears) - while the energetic sense, the mouth that feeds on energy is 'bigger' and continuous (a single one). The eyes, the most perfect of those senses are in fact a perfect sphere. And they process 'bidimensional information' (which latter both eyes mix to create the illusion of 3-dimensionality).

On the other hand the body is a plane, dominant in lineal or elliptic, 'reproductive' forms, bigger than the head, on the bottom of the body-head system. The body moves and processes energy. It has however hardly any sensorial elements, as it gets the information from the body. Its detached elements, the limbs are even more lineal, and only become broken, discontinuous on the fingers, which are the sub-elements that process information. Within the body, the most lineal elements are those who process directly energy: the guts and the lungs (in the brain the cerebellum that controls movement is also a lineal network of neurons that would extend over a meter in length).

Further on biological dual systems are irreducible to monism, since a headless organism cannot process information and survive. Even in the social, mental scale of existence, men have always represented energy with lineal arrows of expansive movement, and time with cyclical clocks of rotating, imploding movement. Thus in our plane of space/time, we find 2 invariant

elements, formally homologous to the energetic line/movement and the cyclical, temporal rotating forms we find in all scales.

- Finally, in Economics, machines and lineal weapons of metal that release energy are valued by cyclical bytes of metal-information (money), 'the brain of the economy', through prices, in a dual, physical and financial economic structure so far irreducible to monism, as the failure of planned economies proved. And when we consider energy and information - machines that men create to enhance their own energy and information capacities - they maintain the invariant forms of energy and information: spherical cameras are informative, and energetic, moving machines are lineal planes.

Thus, the only logic able to explain all forms and species of the Universe is a self-generating dualism, caused by the existence of 2 fundamental invariant, geometrical shapes of energy and information that repeat and emerge in every scale of space/time of the Universe - the lineal wave of energy or shortest movement between 2 points and the cycle, rotating spin or sphere, which stores the maximal volume of information in a minimal volume. They are the most perfect, inverse shapes of energy and information, which repeat in all the species of the Universe:

- All systems that create inner form, information, from DNA nuclei to eyes to brains have similar cyclical or spherical forms because a sphere stores the maximal amount of information in minimal space. And their function is creative, in/form/ative.

- On the other hand, all moving bodies that process energy are lineal, because a line is the fastest, shortest distance between 2 points. So fast felines, F1 cars, light beams and rockets are all lineal in form. Further on, the function of systems that absorb energy is often destructive: for example, felines are predators that erase the information of its preys and missiles are weapons that erase human beings.
- While in any scale of reality, complex, 'organic systems' combine both forms into Ti=k=Se balanced systems. So the 2 commonest forms of Natural fractals are the tree, with an informative head sitting on top of a line/limb of energy and/or reproductive cycle (from virus to sperm, from humans to plants, from robots to missiles); and the spiral, which can easily mutate between a cyclical state, coiling onto itself and a lineal, moving state, as an uncoiled snake (from particles that become waves, to worms, to galaxies that mutate from bars into spirals). Dual organic systems are everywhere: informative particles and fields of energy create physical beings, while all biologic species are made with reproductive bodies and informative heads.

*Some basic morphologies of temporal energy.*

We can consider for each science and plane of existence some basic forms, which imitate the morphology of energy and information; and therefore are very common in the Universe:

- *Lines*: Energy element. I.e.: Swords, limbs, rays.

- *Planes:* Social group of lines. I.e.: Stellar planes, solar planes, mobile platforms.

- *Cycles:* Informative unit. I.e.: coins, cameras,

- *Spheres*: Social groups of informative cycles. I.e. animal heads with a smallish sphere - the eye, the center that processes the biggest quantity of information - and a bigger sphere, the brain also specialized in handling information.

Those forms are the commonest of the Universe. Yet those elements tend to be complementary parts of an organic system.

So they give birth to a 3rd element, whose form combines both, the reproductive body, which is ellipsoidal or become combined giving birth to the commonest systems with both, a lineal and a spherical part:

- *Trees, combinations dominant in energy*: They have a lineal trunk, with 2 fractal ends, one specialized in energy absorption (planar leaves); and the other, a smaller 'head' – a network of broken roots that absorb the chemical elements of the system.

- S*pirals, where the dominant part is information.* They often fluctuate between a lineal and a cyclical state. When the spiral cycles inwards, it is transforming energy into information. When the spiral opens its arms it is expelling energy, often for movement purposes. So the RNA, the worm or the snake coils to sleep and uncoils to move. Sometimes spirals have 2 elements: a central zone of maximal information (nucleus), and an external zone of maximal energy (lineal body). Such is the case of spermatozoids or spiral galaxies with a central black hole of gravitational information and 2 arms of energetic stars.

Finally we can talk of *Social groups* that gather those 'non-Euclidean points' in networks of energy and information that repeat the same forms in a bigger scale. The simpler of those social groups acquire 3 morphologies of energy, information or its combination:

- *Rings.* Informative Disks and spheres gather into rings when they come together as groups. So happens with molecules such as the carbon benzene; with groups of men commenting on any type of information, from informative money (stock-market rings), to social parties; to religious circles (Muslims, Indians), in search of the perception of the network of mind, called God.

- *Strings:* Energetic, lineal systems made with a ring or points tied one after another in a queue.

- *Coiled Springs:* Balanced forms that combine individual elements dominant in energy and elements dominant in information. They often tie a series of spirals through a social dimension developed in the Z coordinates. The best-known case is the DNA spiral - an association of informative rings called Nucleic Acids, joined by a lineal chain of energetic sugars and Phosphoric acids.

Those simple forms, repeated and combined ad infinitum, allow the creation of very complex macro-organic systems made of micro-organic systems.

For example, in physics and biology, orbitals and bacteria repeat once and again those forms:

So there are 3 basic species of social bacteria, called coccus, bacillus and spirillus. Where, *Spirillus are Spiral forms; Bacillus are Trees and coccus are cyclical forms.*

While the electronic orbitals that turn around the nucleus of an atom are either:

*S orbitals,* which are spheres. *Or P orbitals,* which are lineal *forms…*that gather in social molecules repeating again the two basic shapes of information and energy:

$\pi$ *orbitals,* which are cycles. *Or* $\sigma$ *orbitals,* which are Trees.

And so we can keep building new scales of forms, combination of those simplex forms, perfectly suited for their functions: Lines and spheres are perfect forms of energy and information, and spirals and ellipses are the perfect reproductive forms that combine both.

Temporal in-form-ation, like its name says, is a measure of inner form, which we perceive when there are discontinuities in a certain bidimensional surface - a clock, a page, a computer screen - either because the static form is broken into informative patterns (--) or its motions makes a sudden peak (>), bouncing in an action-reaction cycle. Universal entities are constantly generating informative dimensions or erasing them back into extended space, with lesser form. Imagine a hand, in mythic terms the hand of God, wrinkling a paper, the ultimate energy of vacuum space, till it crunches into pure cyclical form without motion - to explode again in a big bang of energy that erases information. Such is the universal rhythm that happens in all the parts and entities of reality.

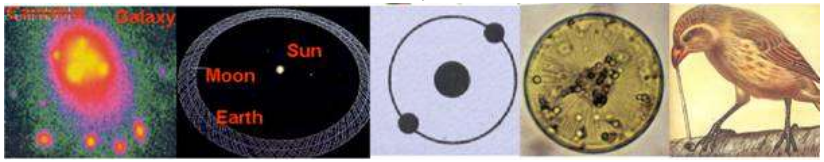
The interaction of the arrow of expansive, lineal, spatial, energy, described by Thermodynamics and the clock-like arrow of cyclical information, caused by gravitation in physical space of by the fractal geometry of any life process that generates information in Biology, *defines the main beat/cycle*

*of the Universe, its fundamental particle:* a system of space-time, constantly absorbing energy from its environment, creating and destroying form, expanding and imploding.

Look around, observe the cycles of existence, legs opening and closing as you move; eyes winking, mouths eating and closing on the energy they will re=form; the beats of the heart; the wings of the bird; night and day; stars of energy (white holes) and black holes of information; big-bangs and big-crunches; the will of the Tao; Chang, the function of existence; bodies and minds; hardware and software; 0 and |; males and females. Since all those dual, complementary systems that follow the essential beat of existence, also merge together their energy and form, e x i, to reproduce and maintain the immortality of their evolved information, which is the ultimate 'reality' the Universe maintains 'ad eternal'. The simple fact that species, which do not reproduce exhaust their energy and end their cycles, becoming extinct explains the overwhelming presence of reproductive events in all systems of the universe. Since all is motion reproduction exists by the mere fact that a motion is constantly reproducing its path. All what we see are paths, trajectories of entities in search of energy and information to reproduce themselves. The how of those paths and reactions is what scientists study in detail. Their whys is what a philosophy of science aims to provide.

*Recap*: The 2 simplest arrows of time, creation of energy and information have opposite properties: From a logic perspective, Energy and information have a paradoxical, dual, causality: E⇔I, which means to create one we must destroy the other. Thus all events are dual: a creation means a parallel destruction event. From a geometric perspective both arrows have inverse forms: Energy expands and creates formless space. Yet space has lineal shape, since the line fills the maximal distance with minimal volume. While information implodes, creating cyclical forms, 'clocks of time' that store the maximal quantity of information in lesser space.

## III. LIFE CYCLES: PAST, PRESENT & FUTURE.




*In the graph, the time motions of all species are guided by the 4 main arrows of time: the motions of atoms, complementary entities with a center of gravitational information (quarks) and a surface of electromagnetic energy (electronic cycles); the motions of molecules, which vibrate as they evolve socially into complex cells. Those cells can also be defined as a series of informative motions with center in the DNA/RNA systems and energetic motions, masterminded by lineal, energetic proteins that surround the cell. The Law of organic evolution determines that those cellular knots of motions evolve into networks and organic chains that form complex vital organisms. Among those organisms, such as the bird eating the worm in the picture, the selection of the best forms causes the extinction of the simplest ones used as 'energy' of the top predator form. Thus survival justifies the growth of individual parts into waves, herds and organisms. Social evolution is also obvious in History, whose final goal is to create a Global Super-organism of equal human beings, who become cells of Mankind. But Mankind is just the 'informative' brain of a planetary body, called Gaia, which we should try to preserve as we preserve our reproductive body if we want to survive.*

### 8. Multiple space-time arrows=cycles=dimensions.

All what you see is caused by a motion of an entity through space-time. This motion can be perceived as a dimensional form, if we consider the entire trajectory of the entity (a world-line in the jargon of metric spaces), like the lines of a car in the night, taken at slow motion. It can also be considered an action born of the need of the entity for energy, information or more complex needs, born of the combination of the previous 2; and then we shall call it an arrow of time, or tendency of future caused by the action of the being. Or it can be seen as a

repetitive cycle, in as much as species switch between the different arrows and needs, so cyclically they return to certain trajectories and actions – feeding, informing, reproducing etc.

*Recap*. There is an homology between the concepts of a cycle of time, a dimension of space and an arrow of space-time or action, exi, which becomes the unit of exi=stence of all beings.

**9. Cyclical times, discontinuous spaces.**

A verbal, logic definition of the 4 arrows will be as follows:

*Energy = Motion; In/form/ation=Form;*
*Reproduction=Repetition; Social Evolution=Network.*

The energy arrow is a change in the motion or translation of beings; the information arrow is a change in the morphology of beings; the arrow of reproduction is the repetition or iteration of an entity in other region of space-time and the arrow of social evolution is the process of evolution of individual, self-similar species (hence reproduced/repeated species), into complex herds, waves and organisms, thanks to their creation of social networks in which those entities share energy and information. So the entities of the Universe move, change form, repeat themselves and evolve into *social networks.*

A Universe made of lineal and cyclical motions is eternal, with ∞ parts in perpetual motion, which show 2 essential properties:

- Time arrows/events are cyclical and discontinuous. What happens in the past will happen in the future again, once the initial conditions are met. And so we can map out 'frequencies' of events that repeat themselves in a cyclical manner: Time cycles are patterns that happen 'from time to time', with a 'frequency', v, which is the essential mathematical parameter to study Time Arrows/cycles. This brings also the geometry and concept of clock-times, which are instruments that mimic those 2 properties. In the same manner we eat from time to time in certain places (our favorite restaurant or dinner room), clocks come from time to time to the same place of space. Yet clocks only show the how and when, the geometry and frequency of those cycles. They do *not* explain why events repeat (we eat because we obey an arrow of time called 'energy'; we make love because we obey an arrow of time called 'reproduction' so we need to copulate and so on.) The discontinuity of time events causes the discontinuity of vital spaces. Since a cyclical trajectory encloses a 'space within it' and outside it. So time events become cyclical trajectories that isolate 'vital spaces', creating space-times of curved nature, which physicists describe with Theory of Relativity.

- Time arrows/events are causal. Time events have an order, A->B, which means event A must happen to trigger event B. We have to be hungry (lack energy) to need more food…

- Time arrows/events are self-similar. Time events happen in self-similar fashion in many different species. All life species for example feed on energy, and so do all particles that absorb energetic forces. And this is the reason why we consider 'energy' one of the fundamental Time Arrows of the Universe that its entire species absorb. Those general 'arrows of change' become in reality specific types of change of species. So science can use those arrows to understand the general meaning of each specific A->B event of each discipline.

- Time arrows/events are multiple, since each species has different types of change, and even though we generalize them with the concept of Time Arrows, those changes do happen individually. There are infinite time-clocks in the Universe, each one with a specific form of change or 'trajectory/motion', and/or different duration/frequency. Thus, absolute time is the sum of all the causal, deterministic paths of events that create the reality of each entity of the Universe.

All those repetitive cycles and changes put together is what we call time, but in many civilizations is called 'Times'. This 'relational concept of times', clearly explained by Leibniz, differs though from the single clock-time concept of Newton[10], which might be easier to use for calculus (reason why it is

accepted in the praxis of science) but will not make us advance much in the philosophical understanding of times-changes.

The existence of those 4 arrows/cyclical actions, which a certain entity of time/space performs, arises from a bio-logical analysis of the fundamental fact of existence: we are made of quanta of spatial energy and temporal information. This implies that the existence of all beings has a limit of duration in time or death and a limit of size in space or individual discontinuity. So all beings need to absorb fractal energy for its reproductive body and information for its mind to continue their existence in time/space. Further on, beings reproduce in order to surpass their limits in time, repeating their form in another region of fractal space/time, overcoming in this way the temporal limit of their existence, the cycle of death. Finally, beings associate to other similar beings to surpass their limits of fractal, spatial size, growing in macro-organisms that are simultaneously a sum of individual cells and actions put together into an Organic Whole that acts as a unique being.

Yet the being will never be eternal and at a certain point its time-space will collapse after performing a sum of those survival cycles. We call the sum of all the energetic, informative, reproductive and social cycles of existence of a being, its generational cycle.

So from electronic cycles that exchange energy and information, described with quantum numbers, to man who acts seeking those cycles, feeding, learning, loving and creating societies, the 'will to create dimensions of existence' is embedded in any cyclical Space Time field that tries to overcome its fractal limits, creating $3\pm st_i$ physiological dimensions. The 'existence' of those cycles is in itself a tautology. Since a being that doesn't perform those cycles becomes extinct and hence no longer 'exist'. Thus all what 'exists' accomplishes those $3\pm\sum i$ cycles/dimensions, including a light photon or a crystal, which repeats its form, associates in molecules and processes energy into information, creating an image within its internal, informative center or vibrates emitting energy. Since all exists to cycle and cycles to exist.

*Recap*. Time events are cyclical, happening 'from time to time', when an entity absorbs energy or information with its field/ body or particle/head. The Universe is a tapestry of fractal, vital spaces, imprinted by cycles of temporal information, which create infinite beings. Those beings reproduce, combining those arrows and then associate in larger social groups. They are the 4 arrows/cycles of time that the 3rd paradigm of metric spaces pegged together into a single space-time continuum.

### 10. The beats of the Universe:E⇔I

The simplest of those cycles of course is the clock: the needle comes always to the same point and closes a cycle. But the clock is a metric cycle of time, as the point is always in the same metric distance from the needle and the structure doesn't move. In a topological space, a time cycle is not concerned with distances and continuity of the cycle but the entity just has to return to a self-similar topological form, which has one of the 3 functions mentioned before – energetic, informative and reproductive topologies/functions.

So a key law of the 4th paradigm is an old law of science:

*Each topology of space performs a time function/arrow*

This law becomes the key to understand those cycles. For example, when a lion comes to a topology of energy called water, and drinks, he is completing a cycle of energy feeding, by intersecting with the plane of water and absorbing it, and that is a time cycle even if he doesn't return to the same water well and doesn't return with the same metric distance, as a clock does in a metric space. What the lion accomplishes is a time cycle in a topological space, in which what matters is no longer the form but the *function of energy feeding. Thus we establish a new concept of a space-time cycle, one in which function supersedes metric form,* and consider that there is a common 'arrow of time' called energy feeding, which all Complementary entities of energy and information achieve.

Suddenly we realize that all entities feed on energy because they need to move and they all have a reproductive body/field of energy which must be replenished or else it will be spent. And this overall function of all systems, feeding on energy becomes the first arrow/cycle of time of the Universe.

Yet all those complementary forms do have also an information network that requires perceiving the Universal tapestry. So in fact, even before the entity feeds it will have to perceive, gauge and calculate information. And this becomes the second arrow of time, of all complementary beings. And again we realize that even physical particles gauge information, and certainly move with it field of forces. So do biological beings that process information with DNA nuclei and heads, and process energy with their cellular bodies. And so now we have 2 arrows of time – a concept that means tendencies of the future - energy and information, and two types of cycles to accomplish them. But unlike the classic concept of science of a single continuous time arrow (the arrow of energy or entropy), because we have now two arrows, time must be discontinuous, as the entity must go from energy cycles to information cycles and this establish the universal, fundamental beat of reality: all entities of the Universe go through a process of motion (energy process) and stillness (perceptive informative process). Since we realize that to perceive and map information you have to 'measure' in stillness. Here it comes the meaning of all those metric spaces of classic science. They describe the arrow of information and measure; while all those analysis of motions and speed describe the arrow of energy.

Thus we define a universal beat of existence, E⇔I, motion, stop, energy, information. Like a movie in which the frame moves and stops to illuminate, creating a form of information, all entities of the universe have stop and go rhythms, day motions and night sleep, and when they move they process energy and when they are still they process information.

In this manner the generator equation of spatial energies and temporal cycles of information appears, E⇔I.

Thus a new field of science of enormous richness is the algebra of time, which studies the previous equation and all its possible beats from where all events of reality will emerge. This equation is to systems sciences and complexity what the Unification equation of Physics is to physicists, a sub discipline of the wider view we bring here - since we shall be able to deduce all the equations and species of all the sciences of mankind from that simple first beat.

For example, all physical systems are complementary, made of a field of energy (e ) and a particle of information (i), which constantly switch between one and the other state: e⇔i.

All cells have a nucleus of informative DNA and a body that absorbs energy and reproduces, and so do all biological organisms with an informative head and a body that absorbs energy and reproduces, i⇔e. And the difference between both is that in physical systems energy=motion dominates and in biological systems, information dominates.

We could say and 'God say move and stop, feed and perceive with your body/field and particle head'; and in this manner he set in motion the game of infinite forms of existence.

Let us then try to classify all those space-time cycles, breaking them 'apart' from the equalized time of the clock that metric spaces have used today to measure all of them.

*Recap*. All what exists is a complementary system of energy and information that switches between both states: e⇔i.

**11. Dimensions/arrows/cycles of Existence in space-time.**

The first astounding conclusion of a careful study of all structures, forms, cycles and events of Nature is that we can reduce all of them to a dualist->4-dimensional scale, according to which all what exists is created by energy and information, the simplex arrows of space-time. Those 2 arrows in a first

layer of complexity combine in social events, and reproductive events, creating the 4 'drives' of all biological beings, since biologists define life as entities that feed on energy, gauge information, reproduce and evolve socially.

Thus from 2 simplex, energy and information arrows come 2 complex, reproductive and social arrows, which give us the 4 'dimensions' of space-time.

We represent them with a generator equation, $\Sigma E \Leftrightarrow \Sigma^2 I$, where we add 2 symbols of social evolution, $\Sigma$ a sum of the cells of the 'body' and $\Sigma^2$ a multiplicative network. Since informative systems form networks that relate all cells among them, multiplying its social power, and $\Leftrightarrow$ the symbol of feedback cycles between energy and information systems that reproduce the entities of the Universe. The equation represents also any complementary system of energy and information in the Universe, and depending on the operandi we use to substitute $\Leftrightarrow$ we can represent one or other system or event.

This simple scheme of 4 arrows, dimensions, cycles or whys of the Universe suffices to understand the nature of reality. And so in most models of multiple time-spaces we use them to explain the events and forms of the Universe.

*Recap*. There are 4 main whys in the actions of all beings, whose cycles create the space-time trajectories that we perceive as space-time: energy cycles, informative cycles and their combination, reproductive and social cycles.

### 12. Energy->Form->Reproduction->Social Evolution

The main arrows of time are energy, information, reproduction and social evolution. We cannot unify further those 'classes of events' without losing 'key information' about them, as Physics or monist religions do, with their obsession with a single 'God' and a single 'Clock-time' to measure all types of times-change. Instead, we can study in detail those arrows, its properties, cyclical periods and the relationships between them. And the first logic question to make on this complex philosophy of science/time is: Can we use Logic Time – the existence of causality; of a successive order in the path of events that go from A to B to C, etc. - to classify those arrows, which include all other phenomena into themselves?

What was first the egg or the chicken is a key question of science. The answer is intuitive – the egg; the seed of information, the perceiver point of view, head or particle of information that gauges reality to decide its energetic motions with a purpose. The Universe, not only man, is intelligent, and so are all its parts. Each mathematical point of view, each knot of Time Arrows, from the simplest atom to the mind, decides first intelligently the 'time arrow' or purpose of its motion in its still, perceptive, informative state and then it moves its mass or body/limbs, where it is the energy to feed itself, or in more evolved beings, where to reproduce or join a social network.

Thus, there is a causal chain that produces the more complex Time Arrows, reproduction and social evolution, from the simplex ones, energy and information*:*

*Information (subject) absorbs Energy to move in order to Reproduce or Evolve Socially->IERS*

This logic order is the most important causal chain of reality, responsible, for the cycle of life and death, the laws of evolution and the eternity of the Universe.

In all universal actions, we must start with a perceiver, I, the subject of all actions, of all sentences. This perceiver - the unmoved one of Aristotle, the Atman, the Soul, the Monad, the Non-Euclidean Point of View of Time Theory - is a knot of Time Arrows, or motions with a will, of wishes and memories. And the first thing it does, automatically, is to perceive flows of energy and create a mapping of the Universe, in its particle-head, then it will move with energy, space, extension, the ultimate substance of the vacuum in search for one of its arrows; it will untangle a knot of memories looking for a replication, I->E->R. The subject will spend its energy/motion,

tracing geodesics, world lines, curved trajectories, all of them mappings in a complex plane of a mere circle. In this manner the subjects become 'forms-in-action', informations. And once we have an entity of energy and form, with momentum, with energy and time, with a cyclical motion, a purpose, once Schopenhauer's Idea becomes Will [14] in search of the immortal repetition of its forms and motions we exist in an event of reproduction that will produce waves of self-similar forms…

It is reproduction, the purpose of existence? No, reproduction is only the beginning of the final arrow of the fractal Universe, which is to evolve individuals into societies that last longer in time, have bigger vital spaces, and hence survive better.

The 4 time arrows imply that the substrata of reality is Time-space, not space-time, since the 3 dimensions of time, past=lineal energy, present=wave /repetition, future=form /cycle are motions; and the existence of causal relationships and social laws that create complex systems of motions, introduce an entire new category of knowledge in the human mind: that of the laws of time-space, the morphological relationships between its transcendental forms and the relationships between the different fractal scales of reality.

*Recap:* The 2 simplest Time arrows of are the creation of energy and information. The *simplest e*vents of time seem to be energetic feeding. To create 'form' we need first 'formless' energy. Yet p*rior to all motions and transformations of energy ther*e must be a perceiver *or point of view, the fundamental logic particle of the Universe, either* a particle of information *- a biological head or any other 'linguistic processor' of information, which defines a path of acti*on – a motion in search of energy to reproduce itself. It is the game of Existen*ce.* On the other hand, to reproduce an entity of energy and information we need both arrows, exi, which combine to give 'birth' to the infinite species of the Universe. Once reproduction happens, the Universe shows a 4th organic arrow of time that evolves socially self-similar, reproduced individuals into waves, herds and organisms. The 4 main arrows of time together define a game of creation of energy and information entities, which reproduce and evolve socially, emerging once and again into more complex forms: lineal and cyclical strings evolve together into particles and forces, which evolve together into atoms made of quarks and electrons, which evolve together into molecules, cells, organisms, societies, planetary systems, galaxies and Universes. For that reason we can establish a causal arrow of Time between the 4 arrows, E->I->R->S.

### 13. The 4 cyclical, dimensional actions of existence.

Any organism or species between conception in its inferior plane of seminal form, (st-1) and its death back to the same plane of cellular existence, exists through those cycles in a social st-plane in which he performs them. Which in Cyclical Time terms means that it performs a fractal, a social sum (+Σe x Πi) of energetic (E), reproductive (⇔) and informative (I) cycles. The study of reality is the analysis of those space-time cycles that we can formalize, departing from the space-time field equation, $\Sigma Se \Leftrightarrow \Sigma^2 Ti$, defining any cyclical action as a partial event of that cyclical equation:

- E<=I: Energy, feeding cycles/dimensions transform information into energy or negative arrow of entropy and direction towards the relative fractal past. They dominate the young 1st age of an Exi field.

-E=>I: Informative cycles/dimensions form the positive arrow of entropy and future that transforms energy into information. All forms process spatial energy into temporal information, from atoms to black holes, which either acquire form or perceive reality. So all beings become 'informed'. They dominate in the old, 3rd age of the Se x Ti field.

Informative and energetic events/forms are inverse arrows that co-exist together, shaping a dual cycle, which sometimes occurs simultaneously, as in a Darwinian event of hunting, when a predator energizes itself, killing the information of the victim. And sometimes 'stretch in the 2 directions of time', from past to future in the process of life and from future to past in the process of death. So we write: *Victim's Death: energy bang = Life: Informative feeding by a Top Predator*

Thus, the existence of many beings can be explained as a dual fluctuation of a space-time field that first evolves, increasing its information, as the entity 'lives' and then devolves, decreasing its information as the entity 'dies', closing in this manner a 'space-time cycle', easily described with the space-time equation. Thus, we 'travel to the past' when we lose information or devolve our form, as when we die, or when we go to a 'relative past culture' that has less information. And vice versa, we travel towards the relative future when we evolve and increase our information.

- E⇔I: e⇔i: The reproductive cycle/dimension, a mixed, internal and external, dual direction that repeats the energy and information of a being in another place of space/time and requires, therefore, the co-existence of the other 2 cycles, and dominate the mature age of each field. The reproductive cycle sometimes is a social, dual cycle (sexual reproduction) and sometimes is an internal, individual cycle. Yet in all cases is the fundamental cycle of existence, which ensures a certain degree of 'fractal immortality'. Since those cycles exist to preserve the being through the repetition= reproduction of its logic form in other place of the Universe. Thus species inform themselves to accumulate energy in order to reproduce their form and cheat its fractal nature, surviving in time by creating reproductive events that happen in all kind of entities. Reproduction becomes the why and will of the fractal Universe: all existential beings perform informative and energetic cycles transforming those 2 substances into replicas of their own morphologies.

- Σ or $\Sigma^2$: The being performs many of its existential cycles as external social cycles, integrated in a herd, Σ of parallel body cells or an informative network, $\Sigma^2$ displayed in two scales (cells and axons), that inform, energize and reproduce together, simultaneously as a group. Since social behavior allows the being to increase its form in space as part of the whole. And so it is also essential for spatial survival, since a bigger form displays a stronger IXE action and survives better than a small one. A fact that we formalize with the fractal symbols, ∑ & $\Sigma^2$ the algebraic parameter that defines all actions as a sum of smaller fractal action-reaction cycles: $\sum Ei \Leftrightarrow \Sigma^2 Ti$. We thus talk of a series of cycles of social evolution, which create hierarchical scales of growing spatial size and organic complexity (max.ExI) that gather atoms into molecules, molecules into cells, cells into organisms and organisms into societies or disorders waves and organisms into fractal cells and particles. It is proper of all ages, studied by each science with different jargons. So in Physics we talk of the wave-particle duality that gathers quanta in particles and explodes them in waves and in Biology of networks that order cells into physiological systems, etc.

- E=>i+I<=e: The sum of all those cycles gives origin to the life cycle, the cycle of the total existence of the being, from its birth to its death; which according to the ternary principle is divided in 3 ages defined by the sequential dominance of the previous cycles, as the existential species or organism will perform more energetic cycles in its first youth horizon, (max.∑Ei), more reproductive cycles in its maturity, (max ∑Re) and it will accumulate more information in its old age, prior to extinction (max. $\Sigma^2$i).

In all fractal, cyclical actions can be subdivided in 3 ages:

- Max. E: When we 'look' to absorb visual information or we 'eat' to absorb energy, in the first age, in the beginning of the cycle, we maintain the eyes or the mouth opened, with max. energy extension.

E=I: Then we close and open the mouth or the eyes, blinking and chewing in an intermediate alternating movement that reproduces the cycle many times.

- Max. I: Finally, we swallow, closing the mouth to 'reform' the food in the stomach into our proper 'in-form-ation' or we think with the brain, and extract the Max. informative perception of the image, in the third, implosive, informative

age of the cycle. So:

*Existential cycle*=Σ *energy cycles + reproductive cycles+ informative cycles*

Thus, the existential cycle, between birth and extinction, is the fractal sum, ∑, of its energetic, informative and reproductive cycles, often performed in social groups (hunting herds, waves, couples), in which energy and information mutate into each other ($\Sigma E \Leftrightarrow \Sigma^2 I$).

*Recap*: The Universe and any of its systems composed of multiple parts form a deterministic, interconnected whole of infinite harmonies between all its cellular cycles, chained by their symbiotic nature, such as the fastest informative cycles gather in ternary and decametric scales, connected to the frequency of the energetic cycles, which are connected to the frequency of reproductive cycles, which are connected to the frequency of the social cycles: I->E->R->S. Since an informative cycle is required for the entity to orientate itself towards a field of energy, and both energy and information together in great quantities/cycles are required to create a reproductive cycle; and finally multiple, self-similar reproductive entities are needed to create a super-organism. The same hierarchical chain happens if we observe those entities in space, such as the pixel of information is minimal, making informative systems smaller than bodies and bites of energy. And each of them is smaller than the total organism composed of both, which is smaller than the eusocial system of which the organism is a single cell.

**14. The life/death cycle.**

The formalism of the 2 simplest arrows of time, E->I and I->E, show that the properties of Information and Energy, of Form and Motion, are reversed:

- Energy moves; it is extended, lineal, big and simple, without form. Since the line is the shortest distance between 2 points. Information seems to us still - a pattern of form, which chains different cycles into shapes. It is small, cyclical and discontinuous; since the circle is the figure that stores more form in a lesser perimeter. Yet in dynamic terms, we must think of expansive big-bangs, extensions and implosive in/formation; 2 intuitive substances that Descartes considered the primary of reality (res extensa=space and vortices of mass /information). Once this geometrical duality is clear, we can deduce how the causal order of those Time Arrows creates in all space-time beings the life/death cycle:

*Energy warps into Information (Life Ages) + Information explodes back into Energy = Death.*

- We are born as energetic, moving children that warp into a 3rd, old age of information.

- Matter is born as a plasma or gas, extended in space, which evolves into in/form/ative solids (atoms, black holes), through an intermediate exi, liquid phase.

So all creations of cyclical particles (masses and charges), all states of matter and all processes of aging can be explained with the two primary arrows: e->i, i->e and an intermediate state, which combines both, the reproductive, mature age of life, the liquid, most complex form of matter.

- Then after a 3rd age of information matter or life explodes, dies, extending in space, reversing the arrows of time: I->E.

Thus the energy and informative arrow together define an immortal Universe made of ∞ bites of energy and bytes of information in cyclical trans-form-ation: a young surface of Energetic Space reproduces in/form/ation till it becomes old and wrinkled. Then it erases its form back into energy in the inverse process of death, completing an existential life/death cycle, which we formalize as the 3 phases of the generator cycle of the Universe: *Max.E (youth), exi, Max.I (old age).*

All beings that exist in time go through 3±st ages that correspond to the 3±st arrows of time.

*-St-1->St-1->St:* We are born as a seed of information that surfaces into the new plane of existence after a process of self-reproduction and organization.

- *Max. $E_{st}$*: Youth: The new born grows its energy-limbs.

- $Es_t=I_{st}$. Maturity: After evolving its reproductive systems, the life being will reproduce, combining energy and information.

- Max. $I_{st}$. 3rd age: The life being acquires more information, warping and exhausting our energy as we implode our form.

- St->St-1: Death: Finally without energy, the warped in/form /ative st-organism dissolves back into st-1 cells; and further on into the st-2 scale of molecular form from where they evolved.

Yet the life-death cycle is not only a travel through 3 ages of increasing information till death reverses locally time and explodes information into energy, but also a travel between 3 planes of space-time existence, as a seed of st-1 information reproduces and evolves socially, surfacing into a 'higher' st-plane of existence and then reverses through death the social process, dissolving back into its cellular stage. In fact, the process normally takes, when studied in more detail two jumps on planes of space-time organization and what we see as 'life' with its 3 ages is only the 'surface' of the iceberg of the complete cycle. In the graph, we observe those processes of creation and extinction of super-organisms departing from forms of a lower scale of existence in self-similar systems of different scales, from top to bottom:

-St-2 atoms become St-1 DNA molecules that transcend into st-cells, which go through the 3 ages/cycles of growth, reproduction and information till its final apoptosis, when they die returning to its st-1 molecular and st-2 atomic scale.

-St-2 DNA becomes seminal St-1 cells that transcend into st-human beings, which go through the cycles of growth, reproduction and information till their final death, when they descend back into St-1 cells and St-2 amino acids used by insects to evolve.

- St-2 seminal cells become st-1 prophets, which create a code of information, the Book of Revelation which is memorized as a meme by all believers, creating a civilization, which goes through the ages of growth, reproduction and informative, baroque art/thought (since art is the mind of civilizations) and finally become extinguished in an age of war.

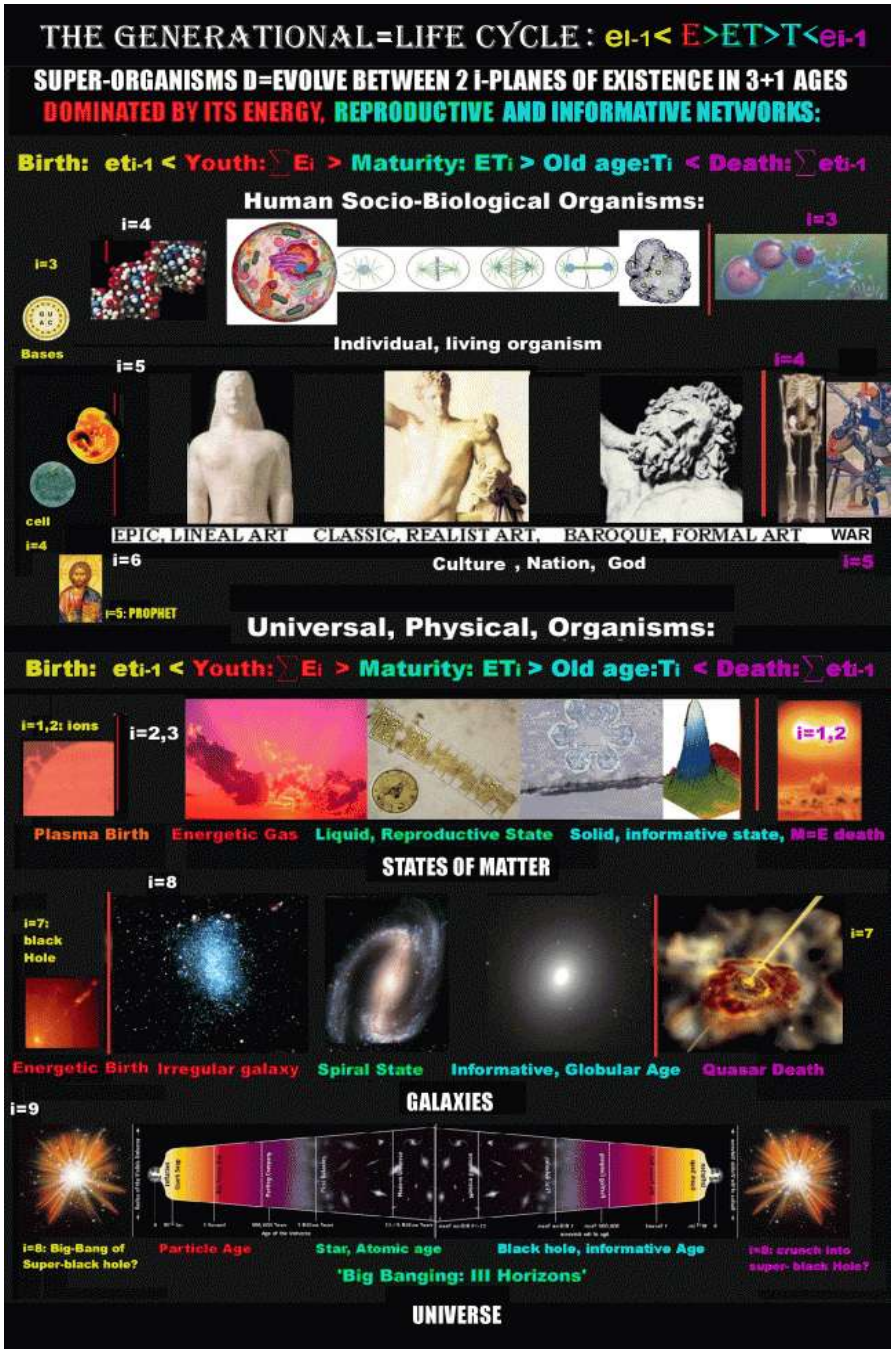
The same process is followed in the lower part of the graph in physical systems:

-St-2 plasma particles become st-1 atoms, which evolve into social states of matter, st-energetic gas, st-reproductive liquids and st-informative solids that further evolve as st+1 bosons into a new social plane of existence or dissolve back into st-1 atomic, ionic plasma and st-2 radiation ($E=Mc^2$).

- The same process in a cosmic membrane creates from a $st_{-2}$ seminal nebula of atomic gas, $st_{-1}$ stars, which further evolve through 3 ages from gas, to liquid to solid black holes that organize a herd of stars into st-galaxies, which die, exploding into quasars and reverting into intergalactic dust ($st_{-2}$).

-So finally, we can consider also the Universe and its big-bang process a self-similar evolution from an initial st-2 quark gluon soup that produces all kind of st-1 systems of dark matter, st-galaxies and st+1 networks of galaxies, giving birth to the Universe that will go through the 3 ages/solutions of Einstein's equations, from a young, expansive big-bang into a steady-state and a final solid big-crunch, giving birth to a hyper-black hole that will explode back into st-2 quarks, restarting the process.

*Recap*: Energy and information arrows are reversed, since to create information we have to destroy energy and to create energy we must destroy information. Thus, the causality of the Universe is 'dualist': I->E (energy creation) + E->I (informative creation) - a fact, which explains the causal cycle of life (E->I) and death (I->E). Thus the 3 dimensions or ages of time are: past, the energetic, young age; present, the age of repetition= reproduction in which the being doesn't seem to change and future or age of information.




**15. The generational cycle**

In the graph, a human being goes from an energetic youth into an informative 3rd age to become erased back into energy. In the Universe those 3 phases of existence in space-time are the 3 solutions to Einstein's equation, which physicists erroneously think to be parallel Universes in space, when they are phases of the same universe in time: the Universe evolves from an energetic big bang into the steady, mature universe of Einstein that will end into an informative, imploding, curved, vortex-like big-crunch Universe - Gödel's solution that will explode again into a big-bang, which is simultaneously the death of a previous Universe and the birth of a new one:

The reproductive age that renews the being into an offspring of self-similar beings defines the generational cycle, which is also a fractal dimension; that is, a dimension with a time-space limit, as all species have a finite number of self-reproductive generations, after which the reproductive system becomes 'tired' and fails. So life has telomere clocks in its genes; and light has a mean life of $10^{10}$ years, after which its self-repetitive wave becomes tired and red-shifts back to dark energy.

*Recap*. The generational cycle is a finite cycle with a limit set by internal clocks.

**16. The immortal Universe, sum of all cycles.**

So the fundamental arrow/cycle that summons them all is the cycle of life and death, which makes us 'transcend' from a seminal seed reproduced into self-similar cells into individuals. While we die, when cells separate from each other and return to the inferior 'plane of existence' from where they departed. Because we are all dust of space-time that creates and dissolves ∞ 'existences'.

Big-bangs that create motion/energy (lineal forces) are self-similar to biologic death processes that dissolve information, expanding and erasing a warped form that explodes into its cellular parts (atomic big-bang, biological death). And they can

be explained with the second arrow, i->e, the arrow of creation of energy, showing the astounding homology in terms of Time Arrows of all entities of reality. Because the generator equation of the Universe, $\Sigma E \Leftrightarrow I$, has only 2 initial elements, energy and form, there can only be 3 'limits' to that function, Max. Energy or youth, e=i, an intermediate age of balance in which both parameters equalize, allowing its combination and reproduction in other form of space-time and Max. Information or 3rd age. Then the information of the organism explodes and its social network dissolves into death, as the arrows of time reverse their order: E>(life)… I <E (death)

Why e->i, the warping of energy into form, proper of the life arrow comes first, and the second process, i->e, the creation of energy from form, and all processes of death come second?

Because to die (i->E) an entity must live first (e->i) (biological proof); to create form we must start at least with a line… of energy (mathematical proof), which bends into cycles or breaks into fractal form. Ultimately to create its particles/forms, the Universe started from an extended formless vacuum (physical form). So the main causal order of the arrows of time is: e->i.

Further on to reproduce, species must copy their energy and information in other part of space-time, creating a replica of the original. So reproduction is an arrow of time that combines two simple arrows, energy and form, which therefore come first:

*E x i = Reproduction.*

Thus reproduction happens once a system has formed its energy and has a minimal content of both, energy and form – reason why systems reproduce a seed of pure information, (max.i), which lives a first youth of growing limbs of energy, a second, mature age of reproduction after adolescence, when the species repeats itself and a 3rd age of warping of form, or age of information; after which they die, completing the life-death cycle, the main causal cycle of time. So, we can consider the existence of 3 ages in life:

*Max. Energetic Growth (youth)-> e x i; e=i (reproduction) -> Max i (3rd age)*

Even if we can now mathematize for the first time, the 3 ages of life, thanks to the formalism introduced by the arrows of time, those 3 ages have been known always to mankind, reason why in the classic age of Religions those 3 ages/arrows were described by Taoism 'the combination of yin and yang reproduces 10.000 beings' in the East and Zurvanism (the philosophical version of Zoroastrism and the most extended religion in the West from 500 BC till Islam), where Zurvan[6] the 'God of Infinite Time' has 3 'avatars', the energetic youth, the age of pleasure and the age of knowledge. Yet of more interest is to relate those 3 arrows with the 3 classic dimensions of 'time', a relative past or energetic youth, a relative future or informative age and a 'repetitive' present, when we reproduce ourselves. Each of us goes through the same life-death cycle, as we wrinkle our young energy into form to explode back into death. Such is the geometric nature of existence in time-space.

Thus, we order the causal arrows of change in 3 'dimensions', past, present and future, which are the 3 logic dimensions of time, embedded in the logic of verbal thought, the biological language humans use to describe time events. Since when something doesn't change, we say that time doesn't seem to pass. But if we are just repeating the same event/form, we might think we are seeing the same reality that doesn't change. So we feel we are in an eternal present.

Finally we feel intuitively that the future as a place with more information, so when we travel into a country like Japan based in the industries of information, we think we are in the future. So we talk of an arrow of future information or life, an arrow of past energy or death, and a present arrow of repetition-reproduction. Yet since e->i and i->e are inverse in properties, and one is the meaning of life and the other is the meaning of

death, and all lives end in deaths, past and future balance each other into an eternal present: 'The separation between past, present and future is an illusion' said Einstein[7].

What Einstein meant becomes now clear, with the understanding of the 3 ages of times, which for each 'knot of Time Arrows', for each entity of the Universe, represents its relative past, present and future. Your past is your youth; your future is your old age. And so if you are in the future of your exi=stential journey, you still will co-exist with the past of your sons, their youth. Further on, since there are species that have evolved further their organism, they are a relative future knot of times. A human is a relative future knot of Time Arrows that co-exists with a worm, our relative past. Thus, not only we exist in a universe of motions, of Time Arrows, but we co-exist with all kind of relative past and future forms.

Since 'times arrows' from future to past (energy) and past to future (form) are infinite, causal events that take place in infinite different beings.

The error of a single time is due to the massive use of time-clocks to measure time, by equalizing all the rhythms of the Universe with the single second/minute/hour standard rhythm of human time clocks, yet the tic-tac frequency of 'other time cycles' is different. Your heart has a slightly faster tic-tac of 70 beats; and a milipulsar of a millisecond and so on. All those systems have an E->I->E->I beat, the fundamental beat of the Universe, which you find in infinite systems of energy and form: legs extended in energy position, warped in form; mouths and lungs opening to absorb energy, imploding when they take in the energy and start the process of converting it into new forms, and so on.

All causal chains of events depart from a young age of energy that warps the form of the species till energy is exhausted, all is warped information and the entity explodes in a big-bang. For example, galaxies start as extended nebulae and evolve into informative masses - black holes of maximal information and minimal extension - human beings also have an energetic youth and end up warped into a 3rd age of information. So do all types of matter that evolve from energetic plasma into a balanced liquid into a solid form of minimal motion.

The immortality of the Universe is therefore the immortality of the properties of those Time Arrows – the geometrical shapes of energy and information; the causal chains of time events those shapes create; the constant reproduction of the basic platonic forms of reality; its association in herds, waves and organisms. Or in mystique terms: 'the forms that can be seen are not the immortal forms', *Lao-Tse.*

Absolute space-time is a simplification of those arrows - the sum of all complementary entities of spatial, extended energy and all time clocks of information in the Universe. Whereas absolute space is the sum of all the vital spaces occupied by those entities and absolute time is the sum of all the events of energy and information taken place in that Universe.

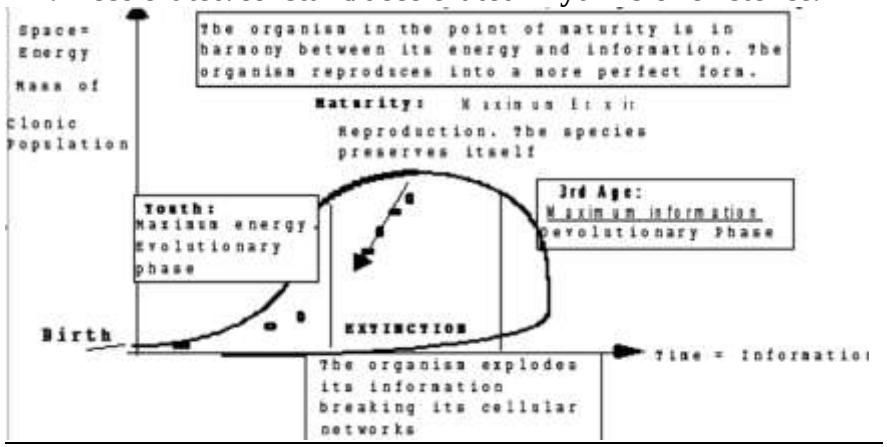
And we must consider that the overall absolute time of the Universe never moves to the past or to the future but the sum of all the cycles of information or life cycles and energy or death cycles, creates an eternal present space-time, sparkled with infinite existences (life death cycles) fluctuating between the past and the future and the past, living and dying…

For reason of calculus is easier to create theories of time that use a single clock-rhythm but a philosophy of science is more concerned with principles than detailed analysis. So we cannot forget, as physicists often do, the fact that time is cyclical, *not* lineal and hence discontinuous - since a circle always closes and breaks space into an inner and outer form. In other words, the Universe is a mass of discontinuous, vital spaces, whose cyclical motions chain to other motions and cycles, creating complex organisms and particles. All those motions and rhythms form complex space-time beings, in which a region of dominant cyclical motions - informative particle or head -

associates with a region of lineal motions - force or body - that moves it, creating a Complementary energy/information being - the 'Fundamental, Logic particle' of the Temporal Universe.

Recap. All the life and death cycles of existence create a virtual fluctuation between past and future that makes the universe an eternal present, Absolute time is the equalization of all those cycles and arrows of all entities that change, with a single time-cycle, that of the clock – an abstraction we must ignore if we want to go deeper into the 'why' of those arrows.

**17. Accelerated/constant/decelerated rhythms of existence.**




*The speed of time/information changes during the ages of life, shaping a bell curve, such as the st-1 age is the fastest age of informative evolution, which diminishes in the young age to a halt, when the speed of cellular reproduction and energetic growth becomes maximal, both reach a steady state in the mature age, of e⇔I, rhythmic back and forth beats; and then in the 3rd age energy decelerates first and then information decelerates and collapses till death provokes a maximal explosion of information into energy. Those phases of different speeds of energy and information can be generalized to any system and event that will always go through 3 ages: an accelerated seminal and young age of increase of form and energy, a steady state of constant speed and a decelerated age till the system comes to a halt and the event dies away.*

One of the key quantitative elements that connect the 4th and 3rd paradigm of metric measure is the fact that not only each species has a different rhythm of change and clock of time, but the same species changes its time rhythms and speeds through its 3 ages. This feature is fundamental to understand all processes that involve evolution, from the different masses of 'gravitational vortices' of information, ruled by the equation of a vortex (VtxR=k in simplified notation, thus the closer to the center, the faster we rotate, the faster the frequency of information of the vortex and the shorter the space we need to close a frequency cycle), to the evolutionary process of information in this planet, which can be mapped out and its frequency shown to follow a logarithmic process of acceleration, which now reaches its zenith with the creation of informative machines. In that regard we can consider the following 'speeds of time' of any event or self-similar ternary topology of energetic youth/membrane, reproductive maturity and informative, 3rd age (hyperbolic center of a system):

-*st-1: Seminal age:* Informative evolution is maximal, since the system occupies minimal space (Black hole paradox: Min. Se=Max.Ti). It is the palingenetic age.

- *Energetic Youth:* Evolution of information decelerates after the 'landing' of the species in the higher St-plane. Now acceleration of energy takes place.

-*Reproductive, mature, steady state:* Both energy and information maintain a constant speed in E⇔I feedback cycles, which will last depending on the access of the event to new energy and directional information.

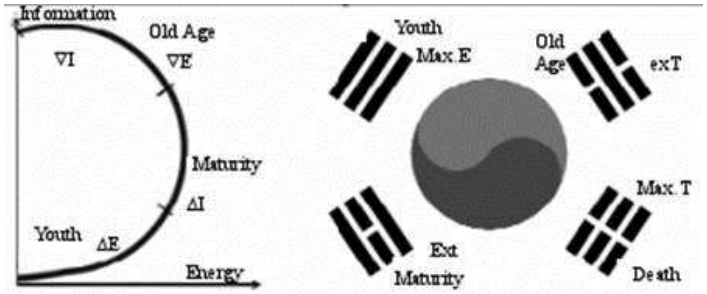
- *3rd age:* Now both energy first and then information follow a decelerated process of collapse; first energy becomes exhausted and then…

- *Death:* Information collapses, exploding into its st-1 scale of cellular energy in a relative zero time (the minimal unit of

time of the st-scale). Death is the fastest motion of the Universe.

*Recap*. In physical terms the 3 ages of biological change can be considered the positive, accelerated youth, the reproductive, present age of constant speed, in which humans repeat themselves and the 3rd negative, decelerated age of temporal age, or 3rd age, which ends in death, when the balance of the Universe is restored.

### 18. The antisymmetry of temporal information: Death




*In the graph, a classic, Taoist representation of the 3 ages of life and its inverse parameters of youth (max. energy) and old age (max Information) represented by the triads of the I Ching, and a modern graph of duality showing those parameters as a semi-cycle, which in certain simple beings like light are in fact both the ages of time of a physical wave and its form in space, as light quanta, h=exi, is indeed both our basic cycle of time and surface of energetic space of which all are made.*

A consequence of the 3 ages of time is its antisymmetry as opposed to the bilateral, mirror symmetry of spatial forces: Time is antisymmetric as the old age is the inverse of the young age with the parameters of energy and information inverted. Youth has maximal energy and minimal information while the old age has minimal energy and maximal information. And yet many attitudes and processes might seem self-similar, if the researcher doesn't know how to differentiate informative and energetic parameters, since those parameters might be quantitatively the same, only that inverted in value. Space is symmetric as left and right reproductions are mirrors of each other with the same parameters of information and energy. This explains why spatial reproduction happens only in the E=I, balanced classic age of the system, when both parameters are identical and a self-similar reproduction of a bilateral, spatial being is possible.

The understanding of the antisymmetry of time vs. the symmetry of spatial processes has wide applications in the solution of questions pending in all fields of research, from the understanding of the temporal, weak, informative force that has no bilateral symmetry to the 'chiral' processes of evolution of life forms vs. the symmetric shapes of self-similar left-right, spatial bodies to the meaning of 'antisymmetric' gender and the 2 'antisymmetric' sides of the informative brain.

But the most important of all antisymmetries is that of death, which could be considered in the jargon of physics, a 'local antisymmetry' of time. Indeed, if life is the arrow of information towards the future e->I, death is the inverted arrow, i->E, that erases form back into energy; but this time travel to the past is always local, affecting only the limited world of the species, so antiparticles are the local antisymmetry of time that kills particles, death are the local antisymmetry that kills life and the big-bang the local antisymmetry that killed a previous Universe. And both directions are different, since 'death' lasts minimal time and causes a maximal space expansion and life lasts maximal time and expands minimally in space. And so both balance reality in an eternal present of past to future to past existential fluctuations:

*Life-future: Max. I x Min. E x Death-past: Max. E x Min. I= Immortal present: E=I*

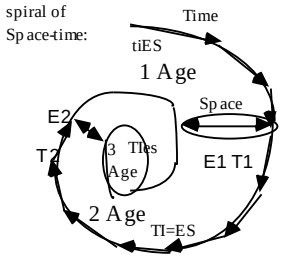
The understanding of that local antisymmetry is the key to resolve problems of physics such as the weak force, why we see less antiparticles or dead people than particles and life people (much longer in time), or the non-evaporation of black holes (as antiparticles are the same than the particle, albeit when moving to the past they seem to co-exist), and so on.

But its implications in biology and philosophy are much larger: we are ultimately 'back and forth' vibrations of space-time, virtual existences, dust of space-time that always revert into a zero-sum, which makes the Universe and its game eternal.

Other form to represent the 3 ages of all species common in Nature that humans perceive simultaneously (as in galaxies with spiral forms or spiraling particles in bubble chambers), is the spiral vortex of space-time, which accelerates inwards its form as it becomes slimmer in space. The first age of the spiral is its energetic mouth that brings in a galaxy the interstellar dust, which will give birth to stars, in the middle, reproductive age and will collapse in the center, the informative black hole.

But any form can be represented in a spiral graph of space-time. For example, the evolution of the FMI complex with its 800-80-8 cycles of increasing informative evolution is an spiral of 3 horizons in a decametric scale: 800 years civilizations, 80 years nations and 8 years 'decades', in which the product is evolving faster and now becomes integrated by networks. This 3-horizon evolving ternary network, central to social sciences can be also represented in a spiral of accelerated birth and death of human civilizations destroyed by wars.

Any mass or charge is in fact a natural spiral, through which photons and gluons become denser till collapsing in the bigger particle, as interstellar gas does in a galaxy. All those spirals can be seen as equivalent to the world-lines of lineal physics, now world-cycles of a living organism both in time and space, as a whole or as a wave of evolving particles.




In the bend graph of space-time, we can describe an organism, as a spiral form. The space=energy of the spiral is given by the transversal volume. Its time or cyclical age is given by the length of the cycle. Imagine the most well known of such organisms: a galactic spiral. The energy of the galaxy is the plane of stars. This spiral graph will be a graph of such energy, as the stars go through its 3 ages of evolution. This age of course is given by the length of the time-cycle. The star will start evolution in the external section of the spiral. As it enters towards the center it will grow in information, in form and diminish in space, in size and energy. The graph shows the process for the entire spiral, though there will be different stars, since the graphic is quantic, with different degrees of evolution. As the stars fall into the organic vortex, they reach form and finally enter the third age, contracted by the black hole into minimal volume..

So the time line shows the age of the population of 'cellular individuals', whi the width shows the energy content of the organism. As in the other graph [lineal graph] we show the population across time. So there are 3 ages put together in the relative present of the graph. This is in fact what happens ir organisms, which have energy cell, and information cells together. What proves of course, that in the cuantic Universe there are no single directions time, but multiple forms with different degrees of cuantic energy and cuantic information.

As we enter the graph information increases [time line is longer] and energy decreases [width diminishes]. Yet there is a relative balance between both, since: E1>E2; T1<T2, pero E1 x T1 - E2 x T2. That is: the loss of energy compensated by an increase of information. So happens to an old man whic has more memory, more information but less energy. We might say both components are in a relative balance together

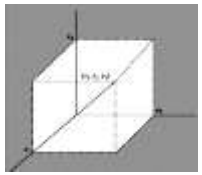
*Recap*. Old age has inverted exi parameters to the young age.

## IV. FRACTAL POINTS

*The fundamental particle of the Universe is not a physical form but a logic particle: a knot of time arrows, which in any scale of reality, from physical particles (quantum knots of energy and information) to biology (knots=networks that absorb energy, information and reproduce and evolve into bigger knots) act under a single mandate: to maximize those time arrows, a fact that we formalize with an equation, the function of Existence: Max. ∑exi; which is the fundamental function of both, logic and mathematical languages. In the graph, all such points of view, will define a system of relative perpendicular coordinates, through which it will enact its time arrows, departing from a central knot of information.*

### 19. Geometry of Multiple Spaces-Times: fractal creation.

Reality is made of entities that are knots of Time Arrows constantly tying themselves up with other knots of Time Arrows, forming networks in different scales of existence, evolving as complementary organisms of energy and information. And the question that science asks next is how to formalize that game of existence, its knots of Time Arrows or 'entities of reality', its fluxes of energy and information, its reproductive flows, herds and motions; its complementary networks of energy and form that create super-organisms. And the answer is, as all models of science with its primary languages of space, mathematics, and time, causal logic, albeit more complex than the logic developed by the Greeks to explain a simpler Universe. In this new Non-Euclidean topology, planes are networks of knots of Time Arrows; and those knots of Time Arrows, the beings of reality are 'Non-Euclidean points' with a volume, or 'organs' that transform back and forth energy into information, creating reality. All what you see becomes then a game of knots of Time Arrows, or 'Non-Euclidean fractal points', connecting themselves to other knots, forming complex planes, networks of points of two types, networks of energetic points (herds in motion) and networks of informative points (still networks). In any scale of reality those networks of points, which are knots of Time



Arrows take place. The simplest scales of atoms can be described as such networks, but also the human scale. Consider a meeting: a series of human heads, moved by a lineal limb will start to share energy and form by producing waves of smaller 'particles' (sounds), and acquire a cyclical geometry as they create an event of information.

The Universe is a self-similar reality of infinite processes of creation and dissolution of networks made of knots=points of arrows of energy and information; and the best instruments to analyse it are the languages of the mind. In that sense, humans, before clocks reduced our conception of time to a single arrow and language, were guided by psychological time, which is our inner perception of our time cycles and drives of existence - our desire to perceive, inform, reproduce and evolve socially. So we lived according to our cycles of energy (feeding hours), reproduction (family cycles), and social evolution (religious and cultural activities). And followed the cycles of the seasons of this planet, according to which all living species calculated its reproductive cycles.

*Recap*: The universe is a game of creation and destructions of networks of fractal knots=st-points of Time Arrows.

### 20. Geometry and logic: The 2 languages of Spaces-Times.


*We describe a carrot with images made by human painters or machines, with numbers, with smells or touching it as a worm*

*does. But only the carrot/being has all the truth and information there is on itself. Any sense or informative language gives us partial information on the species it analyses, its cycles of time and vital space; since all species perceive the Universe through the intermediate syntax of a language. Thus, to evolve human knowledge we improve the syntax of the verbal, temporal and mathematical, spatial, languages we use to describe the Universe.*

Time arrows are not new. Its discovery can be traced back to the work of Eastern and Greek philosophers (Lao Tse, Buddha, Plato, Aristotle), which conceived a Universe (eastern philosophy[1]) made of two Time Arrows, energy and form that combined in reproductive acts, in which time was synonymous of motion (Aristotle's definition), and motion was proof of organicism ('when things move they will be alive' Aristotle).

Yet the ancients failed to formalize properly those Time Arrows. In the West, perhaps due to an excess of detail and the desire to prove all facts of science as dogmas without possible error, the choice has been always for simpler models of reality, even if they were inexact, in order to facilitate calculus and axiomatic proof. Indeed, monism by limiting the study of Time Arrows to the easiest of them all – continuous, energetic, 'spatial', evident events – seems more truth, but it arises from a false, limiting postulate. How this has been solved in western science is clear: all sciences have postulates without proof which are selected a priori, but are by no means certain -only simplifications of the whole truths and causes of reality. This 'righteous' mode of dealing with science proper of the Western psyche explains why from Aristotle to quantum physicists a single arrow of causality is preferred: monism, the belief in a single time arrow of energy seems truth because it is very simple; but the postulate of a single arrow is false. So the truths acquired with such simple 'camera' focused on reality are limited by the syntax of the mathematical and logic languages we use to see reality. Euclidean geometry seems truth because it 'forgets' all the inner content of information of a point, but it has been proved ad nauseam wrong. Aristotelian logic with a single cause seems truth, but it is indeed like a camera, which only works in black and white. What Multiple Spaces-Times Theory offers is a camera with all the colors of reality, by evolving the time/logic and spatial geometry we use to mirror the data of the Universe. Thus what this work tries to do is to upgrade the languages of the mind, the a priori categories[4] where the data of science must be fit to obtain theoretical 'images' that make sense. Truth in that regard is product of both, the information we obtain and the syntax in which we fit that information. This chapter will be dedicated to evolve that syntax and provide mankind with a better mirror/camera in which fit information. This is ultimately as far as humans can go in its search of truth. Since only the Universe has all the information in itself, the absolute truth, truth in human terms will be always the product of the best linguistic syntax, the best logic and mathematical mirrors, the best camera of the mind, and the best data, the biggest quantity of experimental facts fitted in that mirror.

Let us consider what kind of landscapes those 2 languages, spatial mathematics and temporal logic, see, and what escapes their vision within the total information of reality.

Unfortunately, it is impossible to define with the limited knowledge of Euclidean Geometry and Aristotelian logic developed by the Greeks, the formalisms of a dual Universe. *We need a new logic and a more complex geometry, better mind tools that have been developed only at the end of the XX century.* In the East, this lack of a rigorous formulation of logic and geometry prevented Chinese and Indian philosophers - aware of the existence of multiple arrows - to explore the complex geometries and multiple logic Arrows, which were explained instead in mystique texts with metaphors and philosophical parables. So while the west lost 'meaning' for precision, the east understood the 'game of existence' but it did not resolve the details of the 'thoughts of god'. Since in essence, all what you see is a manifestation of the game of

'exi=stence' and its limits, which we could call the game of extinction. Indeed, 'reality' is a simple game in which beings 'appear' and become knots of Time Arrows and then dissolve, unknot their form and disappear. And this happens to everything, from galaxies to atoms, with self-similar patterns caused by the common nature of all those forms. So the big question, no longer asked by western science, which merely collects machine-enhanced pictures of reality, is to explain the rules of the game of existence and extinction, which can be summarized as follows: All what exists are complementary systems that reproduce energy and information (fields/ particles, body/ heads), made of networks of self-similar 'entities', which as such can be studied with numbers, since a number is precisely a collection of entities so equal that we do not need to distinguish them as pears or cars but merely say '3'. Numbers, thus by the mere fact of existence means that the Universe has social properties, makes herds, waves and organisms. And so numbers are an excellent language to explain the properties of the 4th arrow of time, organic evolution. Those numbers however exist in 'space' creating 'geometries', some of which are better than others to enhance the chances of existence, since they allow better absorption of information (the point) or energy (the triangle, whose lineal, structural strength and single form – you cannot join 3 points except forming a triangle – fits this role), or are fit to reproduce (the couple or 2, which can easily combine its code) or are perfect units for social evolution (the 4, which is the first number with several possible join configurations, the cross, the quadrangle, the 'zigzag' snake, able to perform different functions). This very simple example of 'organic geometry', which shows the relationship between the 4 first numbers and the 4 main arrows of time, might seem 'magic' to dogmatic, abstract mathematicians, as it is indeed related to earlier Pythagorean schools both in Greece and China[3]. What modern System Sciences has done is to merge the 'right intuitions' of the East with the western tradition of exhaustive analysis, under the experimental method. And so the eastern intuitions about e/i geometries can be tested with experimental proofs of the geometrical configuration of stable atoms, which indeed are *always more stable when they have a number of particles, multiple of 4, or in crystallography, in which only those configurations that follow the geometrical properties that enhance the 4 arrows of an atom exist in the Universe,* as we have shown in our work on chemical compounds[4]. Since those common laws of Multiple Spaces-Times apply to all the scales of reality.

The first conclusion of this initial analysis of 'Time-space' geometry is clear: mathematics *is* one of the two languages of 'god', the mind of the Universe, because it is basically the language that explains the behavior and paths traced by the Time Arrows of its entities. Yet mathematics is *not* the only language of reality because it is not adequate to show the logic, causal chains of those arrows. And so we need a second language, logic, and again we need to evolve the present state of logic – Aristotelian unicausality – to define the 'temporal' properties of reality. Thus the formalism of Multiple Spaces-Times tries to evolve the logic and geometry of the west, departing from the philosophical concepts of the East, following in the steps of Spinoza, Leibniz and the masters of evolutionary and organic theories of the Universe (Darwin, Butler, Spencer, Spengler, Bertalanffy), which Duality, Complexity, System Sciences, Fractal and Non-Euclidean mathematics are completing now.

The key to grasp the scientific description of the 'game of existence' is to evolve our understanding of the 2 'languages' in which existence in Time-space is perceived, the main language of space, geometry, and the main language of time, causal logic. Since classic Geometry is used only to describe fixed forms of space without taking into account its motions in time. There are however 2 new types of geometry, Non-Euclidean and fractal geometry, which include the properties of Time-space described here – its motions, discontinuities and structure in multiple layers of 'fractal, self-similar forms' that

create a complex scale of discontinuous space-times. Thus, what we do is to fusion and complete those branches of modern mathematics, in order to have the proper tools to study Time Arrows in space. Thus we describe a Universe made of 2 types of formal motions, energy and information, which create the topological geometries of reproductive bodies/fields and informative particles/heads, which in turn shape the entities of reality. Because those topologies have motion, they exist in time, leaving behind 'traces' in space. And because those motions have a causal purpose, they have an order and synchronicity that chains those traces into complex forms.

*Recap*: The evolution of knowledge requires not only the gathering of experimental information about the species of the Universe but a better linguistic mirror of logical and mathematical languages to achieve a higher truth: a more accurate image of reality. How can we explain that complex world of intertwined geometrical and logical patterns with both mathematical and logic languages at the same time? Thanks to the use of 2 new forms of geometry which mimic the properties of Time-space: Non-Euclidean Geometries, which have motion and fractal equations, which are self-reproductive, cyclical systems that repeat and self-organize complex networks of 'numbers' - groups of self-similar forms.

## 21. 5th postulate: Fractal, Non-Euclidean Points of view.

Mathematics, as a language that represents reality with simplified symbols, has a limited capacity to carry information. Its symbols, geometric points and numbers simplify and integrate the fractal, discontinuous reality into a single space-time continuum, the Cartesian Space/Time graph, made of points without breath. However the points of a Cartesian plane or the numbers of an equation are only a linguistic representation of a complex Universe made of discontinuous points with an 'internal content of space-time'. In the real world, we are all pieces made of fractal cellular points that occupy spaces, move and last a certain time. When we translate those space-time systems into Euclidean, abstract, mathematical 'numbers', we make them mere points of geometry void of all content. But when we look in detail at the real beings of the Universe, all points/number have inner energetic and informative volume, as the fractal geometry of the Universe *suddenly increases the detail of the cell, atom or far away star into a complex complementary entity*. So we propose a new Geometrical Unit - the fractal, Non-Euclidean point with space-time parts, which Einstein partially used to describe gravitational space-time. Yet Einstein missed the 'fractal interpretation' of Non-Euclidean geometry we shall bring here, as Fractal structures extending in several planes of space-time were unknown till the 1970s. So Einstein did not interpret those points, which had volume, because infinite parallels of 'forces of energy and information' could cross them, as points, which when enlarged could fit those parallels, but as points in which parallels 'curved' converging into the point. This however is not meaningful, because if such is the case parallels which are by definition 'straight lines', stop being parallels. So we must consider that what Einstein proved using Non-Euclidean points to explain the structure of space-time is its fractal nature: points seem *not* to have breath and fit only a parallel, but when we enlarge the point, we see it is in fact self-similar to much bigger points, as when we enlarge a fractal we see in fact self-similar structures to the macro-structures we see with the naked eye. That is in essence the meaning of Fractal Non-Euclidean geometry: a geometry of multiple 'membranes of space-time' that grow in size, detail and content when we come closer to them, becoming 'Non-Euclidean, fractal points' with breath and a content of energy and information that defines them.

Einstein found that the gravitational Space-Time did not follow the 5th Euclidean Postulate, which says:

*Through a point external to a line there is only 1 parallel*

*E*uclid affirmed that through a point external to a parallel only another parallel line could be traced, since the point didn't have a volume that could be crossed by more lines:

*Abstract, continuous, one-dimensional point:*

. ————

Instead Einstein found that the space-time of the Universe followed a Non-Euclidean 5th Postulate:

*A point external to a line is crossed by ∞ parallel forces.*

*Real, discontinuous, n-dimensional points:*

**========== o**

This means that a real point has an inner space-time volume through which many parallels cross. Since reality follows that Non-Euclidean 5th postulate, all points have a volume when we enlarge them, as cells grow when we look at them with a microscope. Then it is easy to fit many parallels in any of those points. Such organic points are like the stars in the sky. If you look at them with the naked eye they are points without breadth, but when you come closer to them, they grow. Then as they grow, they can have infinite parallels within them. Since they become spheres, which are points with breadth - with space-time parts. *So space-time is not a 'curved continuum' as Einstein interpreted it, but a fractal discontinuous.* The maths are the same, the interpretation of reality changes, adapting it to what experimentally we see: a cell-like point enlarges and fits multiple flows of energy and information, and yet it has a point-like nucleus, which enlarges and has DNA information, which seems a lineal strain that enlarge as has many point-like atoms, which enlarge and fit flows of forces, and so on. So *each point is in fact a 3-dimensional point, and if we go to the next scale, a 3x3=9 dimensional point and so on. Yet those dimensions are the so-called fractal dimensions, which are not 'extended to infinity' but only within the size of the point.* In Euclidean geometry, a point has no volume, no dimension, but string theorists say that even the smallest points of the Universe, cyclical strings, have inner dimensions that we observe when we come closer to them. That is the essence of a fractal point: *To be a fractal world, a space-time in itself.*

*'Any Non-Euclidean point is a fractal space-time with a minimal of 3 internal, topological, spatial dimensions and an external time motion in the st+1 ecosystem in which it exists'*

This simple law is the most important law of the 4th paradigm, foreseen by Leibniz in his Monadology, the foundation of the mathematical model of Multiple spaces-times that completes the 5 Postulates of non-Euclidean geometry and gives us the tools necessary to create a complex new logic and new mathematical model of the Universe, easy to connect through topology with the laws of the previous paradigm of a single metric space-time continuum.

Further on those points must be described always in 4 dimensions, with motion. This should have been obvious if mathematicians displayed besides abstract logic, common sense, but as they simplify entities into numbers and static forms, organic and motion properties disappear. Yet we still say 'San Francisco is at 8 hours from LA', because we mean that journey is a combination of the motion of a car and the spatial distance. Thus we measure reality in Time-space, not only in space as Euclidean maths do. Thus, in the same way Saturn's rings stop being planes without volume when we come closer and observe them as fractal points, called planetoids; Non-Euclidean points acquire both motion and volume when we approach to them. *In words of Klein, a sphere is not a continuous static form, but a group of points in cyclical movement. So in the same way the Saturn's rings are a group of planetoids, a Klein space - the space-time that fills a point has motion - it is the sum of a series of cycles*[5].

Einstein didn't adapt the other 4 Euclidean postulates to the new Geometrical unit: a fractal point with volume. Only then we will be able to define the 2 planes of physical forces, the plane of gravitation and electromagnetism, or any system in which several planes of space-time co-exist together (as in a human being extended from atomic to social planes of cyclical existence). In all those systems planes are made with cellular

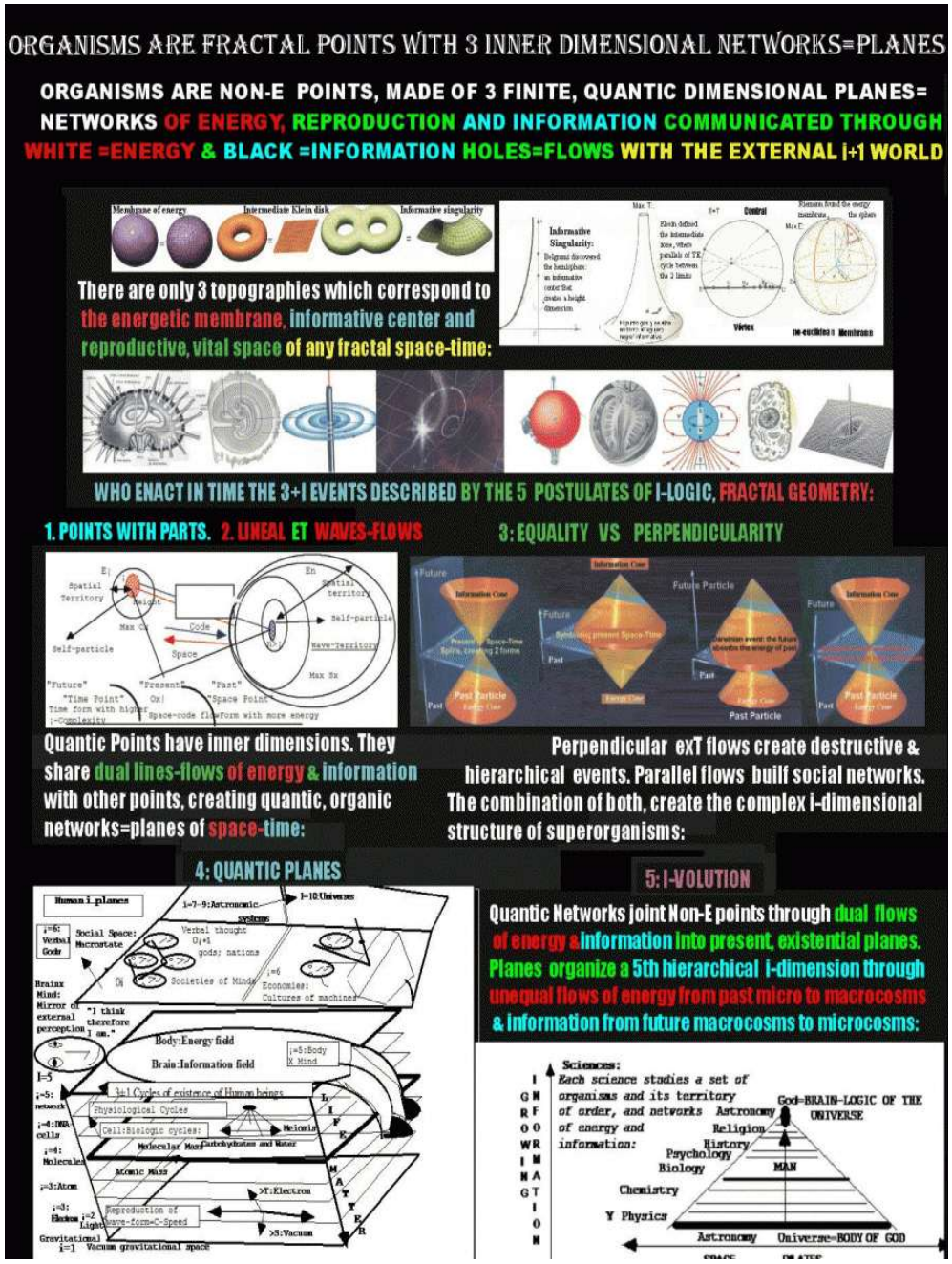
points, Riemannian spheres with volume that form lines, which are waves between points that exchange energy and information and planes, which are organs of self-similar points that process energy or information in parallel networks. Thus the 5 Postulates of Non-E Geometry vitalize the Universe as a series of networks of energy and information of self-similar cellular points. Since the line and the plane acquire volume and become self-similar to the commonest forms of the Universe, the wave and the network of points with a 3-D volume.

This fact explains one of the most important discoveries of modern physics, the Holographic principle, according to which information might be bidimensional, as in the screen of a computer or the page of a book. Now bidimensionality no longer becomes 'magic' since the 3rd dimension is the relative size of the 'fractal point-particle'. Thus bidimensional sheets of information do have a minimal 3rd Dimension; the inner content of the point, which in a relative universe of infinite sizes seems to us a particle-point without volume, as we don't see either the volume of a sheet of paper or a pixel.

Recap: the minimal unit of the universe is a Non-Euclidean point/number, which classic mathematics defines as void of inner form and organic properties, to simplify the networks of numbers and point-like entities of the Universe for its geometric study. In reality though, points have breath; that is, they are real entities with energy and information parts, and so we have to upgrade Euclidean postulates with the new tools of Fractal and Non-Euclidean mathematics to make the language of geometry closer to reality.

### 22. 5 Postulates of Non-Euclidean, i-logic Geometry.

The 5 postulates of Fractal Logic define a point with parts, a line as a wave and a plane as an organic network of space/time points. The 3rd postulate explains the logic interactions of those points according to their relative equality=self-similarity of inner form, *required to start an organic process of eusocial evolution;* and the 5th postulate that explains the processes of absorption of waves of energy and information that the point *gauges to act-react into the Universe:*



1st Postulate: *'A fractal point is a world with an inner content of energy and information that creates its 3 inner dimensions of space and an external motion that creates its dimension=arrow of time'*

2nd Postulate: *'A line is a wave of fractal points.'*

3rd Postulate*: '2 fractal points are self-similar when their external, spatial perimeter or their inner information is equal. Similar points form organic networks by sharing their energy and information.'*

4th Postulate: *'A plane is a network that joins points through waves of energy and information.'*

5th Postulate: *'A fractal point has inner apertures to the world, through which multiple waves of energy and information can cross.'*

In the graph, we show the 5 postulates of Fractal, i-logic geometry. Advances in sciences always depart from the evolution of mathematics and logic, the languages of space and time of the human mind. Then with those 2 languages, each science explains one of the 'fractal space-time scales' of reality and its species of energy and information, which are parts of those organic scales. The 5 postulates of i-logic geometry based in the concept of a fractal point and the advances of fractal mathematics, topology and Non-Euclidean geometry, achieved that evolution. In the graph, from top to bottom we describe those postulates. The first postulate explains a fractal point, as a point with parts. In a more detailed analysis those parts turn out to be self-similar in geometrical terms, in all systems, due to the specific lineal vs. cyclical, concave vs. convex geometries of energy and information and its 'planar combinations'. In its more complex versions those geometries are defined by the three canonical topologies of a four-dimensional Universe, which describe the informative 'head', reproductive 'body' and energetic limbs and membranes of all the superorganisms of the Universe. The 2nd, the interaction between two points connected by a wave of communication or 'line', the 3rd, the type of 'biological' interactions between 2 points according to their relative equality, and finally the 4th, the complex structure of a system of points across multiple organic space-time planes, such as those who create a human being.

Further on, according to the duality between geometric form and logical function, those postulates of fractal i-logic geometry define also the basic arrows= cycles/dimensions of the Universe: the 1st and 5th postulate define a point as a system whose inner parts are able to transform and emit energy and information, e>i<e; the 2nd postulate defines an exi wave of communication that reproduces energy and form between 2 fractal points; and the 4th postulate defines the social evolution of a herd that creates a fractal plane, a network with dark spaces; and the 5th postulate explains a point in its iterative actions as it absorbs energy and transforms it into information through its small apertures to the Universe. Since even a minimal quark of mass, as Einstein affirms should be crossed by ∞ parallels.

The importance of the 'linguistic laws' of i-logic geometry resides in the fact that all systems of the Universe follow in space the laws of geometry and in time, the laws of logic, so the enhanced linguistic mind of science obtained with those laws can be used, as this author has done in multiple works to resolve long-standing questions in all sciences, which can further be ordered in a pyramid of increasing information and diminishing energy: Physics studies the simplest forms with maximal energies. But if we consider the 2nd arrow of 'creation' of reality, that of form, of information, the summits of science are biology, which studies the most complex forms of information (life) and Sociology/Religion, which goes a step further into the analysis on how the arrow of eusocial love creates Human Societies according to the Organic laws of the Universe (Eastern Religions).

To be able to consider biologic behavior (social evolution) and 'mental perception' (informative gauging), as factors dependant on geometrical qualities is an astounding break-through for science, which will be developed in its details in this work, to show an enormous number of experimental proofs. Indeed, fractal, i-logic Geometry achieves a long-sought goal, which Plato, Spinoza and Leibniz tried to realize, but failed, with the use of simpler Euclidean geometry: to unify the logic and mathematical principles of the Universe. Since the 3rd and 5th Non-Euclidean postulates are logic, the 1st and 2nd are geometric and the 4th, the nature of a topological plane or network of non-E points is both logic and geometrical, as it defines the fundamental logic-geometric structure of the Universe: the superorganism.

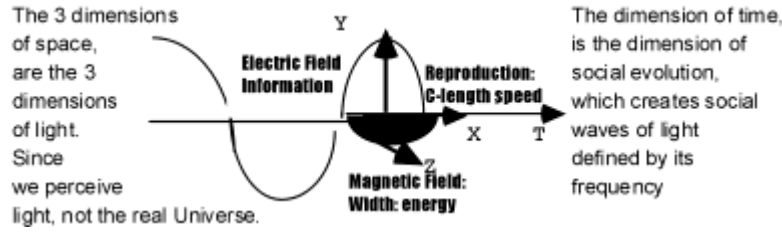
There is also self-similarity between the fractal postulates of i-logic geometry (since the 5th is geometrically self-similar to the 1st, as both are concerned with points) and the 4 dimensional time paths/arrows of the universe. This is not casual since all languages of space-times depict in self-similar ways the 4D Universe. Thus if the 1st and 5th postulates define *a gauging point of information* as the fundamental unit of the Universe, the 2nd postulate defines a line or flow of communication of energy and information between 2 points, which *reproduces* part of the information of the 'generator' point across a surface of space; the 3rd postulate defines those points, which are not similar as *energetic* substances that will be absorbed by the points. Yet if those points are self-similar they will gather through the arrow of eusocial love, creating according to the 4th postulate a network of space/time, a new organic plane of existence. So the 4 arrows of space-time are explained by the 4 postulates of i-logic geometry.

Recap. The study of the geometric paths of Time Arrows with the tools of mathematics, explains the whys of mathematical laws: Geometry and topology acquire now its 'why': topology explains in detail the 3 canonical parts of all Points of view, while the i-logic postulates of geometry explain the universal structures that those points of view create.

In organic terms, the 5 postulates of fractal Geometry describe how points become parts of social webs, which self-organize fractal planes made of networks of points, which emerge as cellular units of a higher fractal space-time or new superorganism... Thus, according to the Principles of Correspondence and Relativity, proper of physical reality, those different geometries are relative descriptions of the same fundamental structure of the Universe: the point with parts and its more complex social forms, lines and planes. The fractal generator of the Universe is a logic equation that represents the main interactions between the arrows of time. Yet all languages mirror that logic equation in its syntax, since all minds gauge and represent the cycles of the Universe with languages of perception.

### 23. The membrane of light-space in which we exist

*In the graph, we have an electronic mind, which uses the smaller pixels of light to inform an eye-wor(l)d. Thus the 3 dimensions of light are the 3 dimensions of space and the 1 second rhythm of the eye becomes the rhythm of our thoughts.*

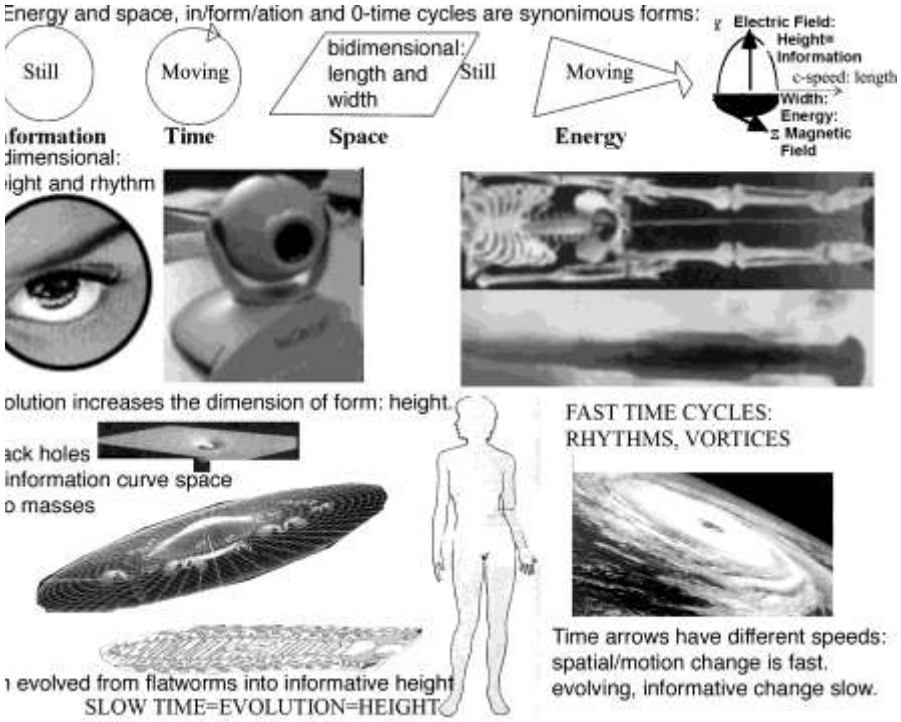



The 3 dimensions of Euclidean space used by Descartes in his book 'The world' to show the mind-space of humans define what science observes with its electronic instruments: a world made of light. If we could empty of background radiation that vacuum space, a membrane of gravitational flows would surface. That was the wider fractal world that Einstein studied. The consequences of being made of light and confuse tall the space-time cycles with the rhythms of light as our mind perceives are main, especially when as today science is not clearly aware of this even if it studies that light membrane in

great detail. For example Einstein considered the light space the speed of measure of the mind the absolute speed of the Universe. We considered for many years the 3 Euclidean coordinates of light, its magnetic electric and speed fields, the 3 dimensions of all spaces, and we consider the electromagnetic, entropy, expansive qualities of light the nature of all spaces that must expand in the big-bang theory of reality. In reality the systems of the Universe are more complex, as the light space membrane with its minimal units h-Planck actions, evolved into virtual particles, photons and electrons, messes with another membrane, the gravitational membrane of string actions, quarks and black holes, which Einstein studied. So the world we see is the light-membrane imprinted in the previous world and transformed further into a more informative, stillness by the electronic mind that fixes the motions of light in electronic nebulae, units of our perceptive Universe.

Recap. The 3 dimensions of Euclidean space are created by the homologous 3 dimensions of light, which represent its arrows of energy (length or c-speed), reproduction (width or magnetic field) and information (electric height.)

## V. BIDIMENSIONAL SPACE &TIME




### 24. The Holographic principle[9]

In the graph, closed time cycles are discontinuous, cyclical shapes, which have 2 dimensions. This means that information is bidimensional (Holographic Principle); and we have to redefine the 4 dimensions of space-time. Since time-clocks of information have 2 dimensions; so the vacuum energy of space must have only 2 dimensions - length and width - which are lineal. This happens because forms in the Universe imitate the most efficient shapes of energy and information. Thus, informative systems resemble a spiral or sphere that stores max. information in min. space, accumulating its cycles/cells in the informative dimension of height, from black holes to heads and nervous systems. While fields and bodies of energy resemble the line or plane, its opposite, geometrical form that covers, as the shortest distance between 2 points, the maximal

extension with min. volume, accumulated in the width dimension as 'space'. The Universe's space also has a flat shape, with minimal height (content of information), as it stores the spatial energy from where future cyclical forms and particles will evolve. In fact, any 'fractal part' of the Universe in which Time curves, evolves the forms of beings, acquires a dimension of height as it increases its information. So life started as a planarian worm, which evolved into the height of man; matter starts as vacuum space, which evolves into the 'infinite' dimensional height of the black hole and all systems of information have their 'receptor' antennas on top.

The systems of reality are messings of 2 type of fractal networks, 1 of energy and 1 of information, which contact in a perpendicular way, penetrating through exchanges of flows of energy and information: Rosen bridges in space-time relativity, alveolus in blood systems, cells in biological networks, etc.

Those topological networks can be considered bidimensional networks, in which certain entities simplified as numbers without form in Euclidean mathematics, but made of networks of points with volume or fractal points in the new fractal paradigm of the Universe, are therefore bidimensional topologies with a minimal volume of points-particles

Bidimensionality doesn't mean there is NOT a 3rd dimension, but this 3rd dimension must be considered the volume of a fractal st-Point, the new unit of geometry, that becomes larger as we come closer to it. Such points create 'thin' networks that seem bidimensional. Each of those networks is a stable web of lines of communication between knots, which create topological planes with an energetic or informative shape.

Those groups of st-points create bidimensional forms: herds of energetic space, $\sum E$, and networks of information, $\sum^2 I$, whose axons intersect perpendicularly the sheet of space, giving birth to a 3rd cyclical, reproductive, topological dimension of symbiotic flows of energy and information shared among the complementary networks, $\sum E$, $\sum^2 I$, creating a social super-organism, which expresses the arrows of time; hence defined the also in dynamic terms as a knot of time arrows:

$$\sum \textit{Social love} \rightarrow \sum \textit{Energy } X \sum^2 \textit{Form} \rightarrow \textit{reproductive zone}.$$

*Recap*. Clock cycles are self-similar bidimensional trajectories. Information has 2 dimensions, frequency and height *(holographic principle)*, and so it does vacuum space, which has the dimensions of width and length. A clock cycle breaks space into an inner & outer region, creating discontinuous in/form/ation. Bidimensionality however doesn't mean there is NOT a 3rd dimension, but this 3rd dimension must be considered the volume of a Non-Euclidean Point, the new unit of geometry, a fractal point that we can observe larger as we come closer to it.

**25. Einstein's Equivalence: Bidimensional mass.**

*The evolution of the concept of mass, from classic physics, in which the rubber-model of relativity considered mass a solid substance in the center of the gravitational space-time whirl, to the pictures of bubble chambers in which the vortex seems not to have anything in its center, as a hurricane does, to the fractal understanding of those vortices of mass as composed of many smaller fractal vortices.*

Why the existence of bidimensional time cycles, which carry information is not explained by science? The reason is the Galileo's paradox ignored by physics: the fact that, when observed in detail, all what exists is in motion – hence it is an event in time - and yet most things we see seem static, quiet – hence, they look like forms of space. Yet space is merely the short perception of a Time motion – a cycle or trajectory of an entity from past to future, seen as a simultaneous form. All what is perceived as a form of space is part of a long motion in time - a clock-like cycle that carries information.

Galileo's paradox shows that the 2 ultimate substances of our physical models of reality – masses and vacuum space - which seem 'fixed forms' have motion:

Masses and charges are cyclical vortices that curve the lineal energy/motion of the 2 forces of pure space –light and gravitation– into whirl-like vibrations. So a charge is caused by the cyclical warping of a lineal motion called light into electronic vortices; and a mass is caused by the cyclical warping of another lineal force with energy-motion, called gravitation, into mass vortices ($E=Mc^2$ in Relativity.)[11]

This again is not clear to physicists, because there are two theories of mass – that of Einstein, called Relativity and that of quantum theorists, which sponsor their own theory about mass, called the Higgs Theory. Yet Einstein's theory of mass, General Relativity, is the basic theory of gravitation and mass in the Universe, proved right by multiple events of cosmology. So Relativity should stand as the most probable truth. In such theory a mass is defined by the Principle of Equivalence between gravitational forces and acceleration. According to that principle, acceleration and mass are the same, as when you accelerate in a rocket, car or lift and feel heavier. But since there are only two types of accelerated motions, lineal, energetic forces and cyclical vortices (whirls of space-time), and gravitation is a whirl of space-time, Einstein came to the conclusion that you could describe reality as a combination of two motions, cyclical motion with more form, 'informative' motion, origin of masses, which are whirls of space-time that attract like hurricanes do, accelerating towards its center, and lineal forces, energetic, expansive fields.

Space is not static, but a type of energy or motion that 'occupies space', which has extension. And since the shortest distance between two points is a line, the motion with more extension is lineal motion. Thus, the purest space is lineal motion. Once we realize of this paradox of perception, all what exists become a 'form in motion', a time motion. And so we define two types of essential motions in the universe: lineal forces and bodies, which specialize in lineal motions or energetic motions and cyclical particles (masses and charges) and heads, which specialize in cyclical motions that create forms and are often perceived as static information. In the graph we see that duality between the still perception of energy as 'space' and clock-cycles as information and its real motions. Several facts explain those perceptive paradoxes:

- The 'expansion of space', a key feature of the Universe, is synonymous of motion. Since that expansion can either be described as a 'growth' of space between galaxies (big-bang theory) or as a measure of the speed of galaxies that move away from each other (z-red shift theory). So vacuum space and energetic, lineal motions are synonymous.

- All what we perceive as static has, in detail, some motion. Thus, in the same way we perceive in the night a moving car as a fixed line of space, we perceive the space of the Universe as static though it is expanding, moving. And we perceive the Earth as static even if it is rotating (Paradox of Galileo).

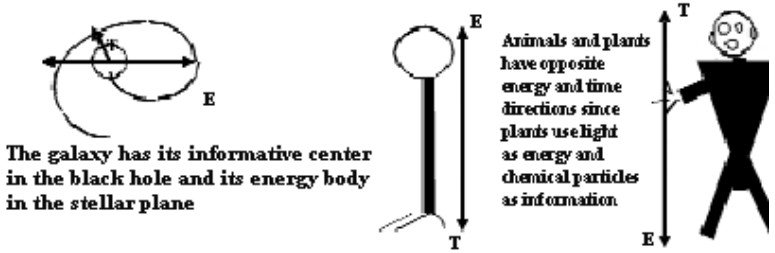
- A 3rd proof of the temporal, motion-like nature of reality comes from the role of light in our perception of space: The last substrata of physical, vacuum space is light, (BG radiation) - a force in motion that shares the 3 Euclidean dimensions of canonical space, because both concepts vacuum space and light are synonymous: the 3 perpendicular dimensions of Euclidean space, width, height and length, are equivalent to the 3 perpendicular dimensions of light-space - the electric= informative=height field, the magnetic=energetic=width field, and the length=reproductive field (since a light wave reproduces its form in the length dimension). Thus, we 'see' space as made of 3 perpendicular dimensions, because its substance 'light-space' is made of 3 perpendicular motions. Both concepts are the same: the 3 dimensions of static vacuum space are the 3 arrows=motions of light: its energetic, magnetic field, its informative, electric field, and its reproductive, e x i,

field of speed. Those 3 motions occupy and create vacuum space. While the 4th arrow of social evolution of light is what we call 'colors', which gather many photons into a single color and complete our perception of space. The equality between spatial dimensions and light motions - the substance of space - is proved by the condensation of vacuum space into light photons. Yet the mathematical, probabilistic depiction of that phenomenon obscures its cause among physicists. On the other hand, painters know this equivalence since the impressionist, pointillist schools discovered that we paint light, not space.

We add to light-space a 2nd spatial force, gravitation, which we do not perceive, but seems to curve the Euclidean geometry of light-space, according to Einstein's relativity[12]. Thus, there are 2 space membranes: light-space, the space we perceive; and gravitational space, which we do not perceive directly, though we know it exists because its force/energy affects reality. So the total space of reality is shaped by the combined creative effect of two expanding energies, gravitation and light. Thus, space and its dimensions are *not* an abstract, mathematical reality that exists independently of light and gravitation – an error caused by the use of an abstract, continuous Cartesian graph that seems a form of space, independent of the entities that exist within it. Space is made of those 2 moving forces, reason why we cannot move faster than light-space, the maximal motion-distance of our perceived Universe.

*Recap:* What we call vacuum space is the static, 'dimensional' perception of the energy/motion of light and gravitational forces that fill the vacuum. What we call a mass is the static perception of a whirl of vacuum energy, a clock-like, cyclical motion of time. Hence, since all is motion, including the 2 ultimate substances of reality, the energy of space and the forms of masses and charges, all is in constant change, all is time. Thus, we exist in an eternal Universe, made of time motions, which our perception fixes into a continuous, still reality.

**26. Diffeomorphic dimensions: fractal relativity.**




*In a Universe made of ∞ time arrows that gather together into 'complementary knots' of energy and information, each being is a relative fractal Universe, which we call a 'world' or 'space-time being' that deploys its particular 'directions of height-information', 'length-energy' and 'width-reproduction', different from those of other beings. All those fractal Universes interact through its particular, 'local'=diffeomorphic coordinates, which departing from a central Non-Euclidean Point of view, or relative 'self', establish the 3 relative, perpendicular, minimal dimensions of any fractal world that signal its arrow of energy, information and reproduction.*

In the graph, 3 diffeomorphic beings and its relative arrows of energy and information: a galaxy with an inward arrow of gravitational information, pointing towards the central informative black hole; a tree and a man, whose informative/energetic dimensions are inverted. Since plants use light as energy and animals use it as information. So the informative direction of animals is up, towards the head that absorbs visual information from the sky, opposite to the informative arrow of plants, which is down, towards the roots that absorb chemical information. Both have their space-time parameters inverted, as often happens between energy victims (in the graph, plants) and their anti-forms or predators (animals). Such energy/information, relative past/future inversions happen in all Universal systems. For example, they happen between a 'particle' and its 'antiparticle', which in a Feynman diagram have also inverted coordinates of space-time, as the antiparticle travels to the past. They also happen in

mental, linguistic codes that represent that external reality. For example, eviL=death is the exact inverse word of Live. Since indeed, for a living human being, there is no bigger eviL than death. Yet, death, a release of energy that kills is the inverse function of information, the arrow of life. So the linguistic, spatial inversion of words corresponds also to an inversion of time arrows – a fact that explains scientifically the biologic meaning of ethics. Since humanity, history and religion are a sociological space-time that obeys the same homological laws of Multiple Spaces-Times. Thus each species establishes its own up and down arrows; its relative energy and informative directions, departing from that central knot of information, which is gauging and perceiving. What classic science denies and system sciences proves is the reality of an existential will in that perceptive=informative knot, which controls the entire organism and directs its search for 'actions' that provide energy and information to the being. It is precisely the infinite number of Discontinuous, Non-Euclidean Points of View, what creates a general arrow of Information in the Universe that constantly reproduces the form of those entities and balances the arrow of continuous entropy, energy motions and expanding space, which physicists dogmatically consider the only arrow of the Universe.

According to the Principle of Correspondence, any new theory has to include the previous theories within it and solve the questions unresolved by all those previous theories. Since the XX C. theory of space-time is Relativity, it is unavoidable, to explain the Principle of Local Relativity from the perspective of the Time Arrows of each species. Relativity establishes that in any point of the Universe the coordinates of the entity (the up and down, right or left directions) are different from those of any other point of the Universe, as they only depend on what happens in that local region of space/time. This is only possible if space/times are fractal, discontinuous, broken into infinite points of view that gauge and map the information of reality from its own perspective.

Relativity thus is at the core of the structure of the fractal reality and must be considered the right step into the process that has taken the knowledge of multiple space-times from Leibniz's analysis of relational space-time to this book, which generalizes all those findings to all disciplines and species.

According to Relativity what happens in a point of space-time doesn't affect what happens in other isolated, discontinuous point. Each space-time fractal is a Relative Universe=World in itself. Thus the laws of space-time apply locally to each fractal 'species or superorganism or world' that will reflect those laws in its own structure. We are local, 'diffeomorphic' species; our time-space coordinates are relative. Time wrinkles our vital space in the process of aging with different speeds, depending on our content of energy and information. Hence the diffeomorphic principle also establishes different informative cycles – the multiple 'clocks' of Nature that show different speeds and locations. Yet since space is synonymous of energy and time synonymous of information, we can establish the local coordinates of space-time of each being by establishing its relative informative and energetic arrows - its relative body and head - using the invariant Laws and dimensions of all spaces and times, *as long as we can localize the origin of those arrows; that is, the Non-Euclidean point of view, where the will of the Entity 'exists'*.

Some geometrical tips about the location of those points in any superorganism or world should guide researchers:

- The point will be a relative 'unmoved' Aristotelian God, cause of the motions of all the other elements of the organism.

- The point has the max. density of information and the max. number of connections with all the parts of the organism.

- The point is in the center or top of the organic system.

- The point is a spherical or convex, informative shape.

Thus in a human the point of maximal will is in the eye-brain system, on top, with spherical (eye) and convex (brain

form), which has the maximal connections with the rest of the body (nervous axons), the maximal density of information and it is the part of the organism which maintains more often a still position (balanced by the negative sensation of vertigo.)

In a historic organism, the point will be the capital, most likely in the zone of maximal communication of the nation – a coastal port, like London, Amsterdam, Rome or Athens or a central city like Madrid, Moscow, Mexico. In a cell the point is in the center, with max. DNA information. In a galaxy, the point is in the center, where a swarm of black holes control from its unmoved position the motion of stars.

According to the 'Diffeomorphic Principle of Relativity', every fractal space-time is independent of all the others; since it has different spatial and informative orientations. Yet we can recognize its informative and energetic organs in relationship to each other, since both will respond to the opposite dimensions and morphologies of energy and information.

Those laws of geometry also allow us to study 'dual' complementary entities of energy and information (Bodies/Brains, fields of forces/particles, energetic victims/ predators), which will create complementary entities that last in time (organisms) or are Darwinian events where the larger, energetic victim is prey of the smaller, informative point.

In the graph, in biological species animals use light as information and so they are 'informative', smaller and faster than plants, which use light as energy and are 'big, slow' beings. Thus plants are the relative energy of animals. Further on, since what it is energy for plants is information for animals, both species have opposite energy-time coordinates: plants have their brain upside down in their roots that 'feel' chemistry; while animals have their brain on top, looking at the light they use as information. In the cosmological scale stars are big, slower than black holes, which rotate faster and have cyclical height. And the space-time equations of black holes are inverted to those of electromagnetic stars. And so stars are the relative energy that feeds and reproduces black holes, which seem to behave as 'gravitational animals', species that perceive gravitation as information, which guides its precise movements through the galaxy, in the same way animals perceive light as information. While plants perceive light as energy in the same way stars absorb gravitational space-time as energy, deforming it with their masses. That cosmological homology defies the anthropomorphic myth that only humans perceive the information they gauge. That religious myth, which denies the sentient, intelligent nature of the Universe, is today a dogma of 'mechanist science'. So it will not be easily accepted by the self-centered 'Galilean paradox' of Humans, who always will think to be the center of the Universe. And since science is a human endeavor, 'enlightenment' and respect for the sentient Universe will not happen soon. Yet only a theory that affirms the existence of will in all knots of information that control from its unmoved position reality explains the role of black holes in the galactic ecosystem.

The discontinuity and minuscule size of informative points, due to its opposite properties to those of space, makes them difficult to localize by science, and our incapacity to 'perceive' the internal mind/world of the point makes easier to deny them. Indeed, all mountains have a single point of discontinuity in its informative height. And so you have also two single points of will in your complex visual/verbal I=eye-world: the nervous point that connects both eye-visions which determines your rhythm of space and time (the size we perceive as normal given by the eye vision and the rhythm of our human time, a second per thought, equal to the rhythm of perception of the eye, which winks every second); and a yet unknown cell, probably a Purdinke cell in the limbic system that defines our emotional actions, the will of our body.

Those points are stillness, as it is in your eye, to 'focus' and create a map of linguistic information, which will guide the actions of the point. And so a basic beat of the Universe appears in all systems; a rhythm of:

*Stillness(perception) ->action(motion searching energy/form)*

For example, in Relativity, this dual beat explains the Michelson experiment, without the need for the *never proved postulate of a limit of c-light speed in the Universe, today clearly shown false by experimental evidence (non–local gravitation, quasars expelling matter at 10 C, dark energy flows, quantum tunnelling, the spooky effect of entanglement, etc.).* In classic relativity this limit was needed because classic physicists considered that the electron was in motion when it emitted light, and so they had to add the speed of the electron and the speed of light. In fractal relativity the electron 'stops' when it emits information (the light frequency) then moves and so motions do not add since when the electron emits information is always in the particle/still/informative state. And so the Postulate of a c-speed limit is not required. This dual stop and go process is also evident in film: the celluloid stops to let pass the light and create an image in the screen even if we perceive it in constant motion by adding all the stills, as we add from the human point of view, all the stops and goes of the electron that emits the light observed in the Michelson experiment in a single flow of motion.

The existence of an information arrow explains also the paradox of informative, evolving, life species in a Universe that seems in energetic expansion: If we are external to a certain diffeomorphic space-times its directions do not affect us, but if we are inside a certain space-time, as in the case of the galaxy, then the direction of information or energy of that macro-being becomes the direction of energy or information of our ecosystem. Indeed, there is more information in the center of the galaxy, and since the Earth moves towards that center, this planet increases its information towards the future in its relative discontinuous galactic space-time, regardless of what happens in the Universe as a whole, which seems to be ruled by the opposite arrow of big-bang expansion and entropy. This subtle change of paradigm caused by the discontinuity of space-time (from a world ruled by entropy to a galaxy ruled by information) has in fact enormous consequences to our daily life and explains the contradiction between the arrow of life and evolution, local to this planet, and the arrow of energy and entropy proper of the intergalactic space. Since here in this galaxy space doesn't expand but time-information contracts it through the 'will' of informative black holes of mass and in this planet, through the 'will' of living beings. As Woody Allen put it in Annie Hall: 'Brooklyn is not expanding'. I recall to ask Mr. Hawking in a conference at the Astronomy Institute of Madrid this same question, when at seventeen I was starting to doodle with the first principles of Multiple Spaces-Times Theory: 'why space is not expanding between you and me?' He wondered for a minute or so and responded 'next question'.

Einstein had only to go a step further in his analysis of the curvature of time, closing times into cycles that return to its origin. Then time becomes multiple, one for each closed cycle and the space-time continuum becomes the sum of all the vital space-times of each knot of Time Arrows. Einstein hinted at it when he affirmed that time was local, 'diffeomorphic' and had 'different speeds' and the universe had 'infinite clocks of time'. Indeed, each of those local times 'curves the energy of space', creates masses and forces of in-form-ation that establish a 2nd arrow for the Universe, besides the arrow of energy/entropy - the arrow of fractal information. Since a cycle needs 2 directions to close into itself and create its broken form.

*Recap*. There are ∞ fractal space/time fields that constantly adapt their organic, moving dimensions to the directions of their relative energy and temporal information, conditioning the existence of its micro-cells; and so the galaxy conditions the arrows of time of its cellular sun and human beings of maximal information; while plant which obtain only energy of the sun have inverted parameters to those of animals.

### 27. Limits of 3rd paradigm: discontinuity and homology.

The discontinuity of space implies that perception of any other area of the Universe is minimal, relative and deformed by

the selection of information and its transformation when it passes through the fragmented boundaries of the perceiver. This fact also offers a rational answer to the Uncertainty Principle, which is with the complementarity of energy forces and informative particles, explained by the duality of energy/information systems, the main law of quantum physics. Since in the Universe, all constant present systems will be made of an arrow of energy and an arrow of information, seen as bodies and relative fixed heads of the system. Thus all relative space-times will be composed of a cyclical center of information or brain, and a lineal limb of energy, whose morphological characteristics will be self-similar.

For example, in a spermatozoid the head is cyclical and stores information, while the tail is lineal and moves the head with its energy; in a human, the body is lineal and moves a cyclical head. We could extend this duality to almost any organic system of the Universe, concluding that bodies are lineal and brains are cyclical. This morphological feature of Universal Organisms derives geometrically from the capacity of lines to move faster and cycles to store more information and grow or diminish in size without distortion of the mental image they might keep (topological laws). Thus, a convex brain with the topology of information becomes the center of informative networks; and a concave body becomes the center of energy networks. And we recognize bodies and brains by their self-similarity with the morphology, function and inverse properties of ideal energy and information:

- Information is both, easy to store and perceivable by a reduced brain or sensorial organ, since it is the inverse function of space. It needs certain morphology: Information occupies little space by warping itself into multiple dimensions, as a sheet of paper corrugates into the dimension of height, divided along broken lines and discontinuities that become its perceived forms in space. Or it displays a high frequency or discontinuous rhythm, a faster time speed that iterates the same cycle, allowing quantification. Information then seems 'quiet' as those patterns of cyclical frequency take place in the same space; so an organ of information can focus and analyze them as pixels of a more complex mapping. Thus its ideal forms are disks, cycles, angles and spheres, convoluted and broken in patterns of form, such as your eye or brain, a chip, a book, a pixelate image or a coin, earlier unit of monetary information.

- On the other hand Energy moves. So limbs extend in space as they move and feed. In life, energy is the equivalent to biological food, which fuels a species and allows its movement. Energies are the lineal limbs that move the reproductive body & brain of information. So energy and space are synonymous: a plane is the geometry that extends further in space and the line the geometry that moves faster with lesser friction. Both are the fundamental forms of energy-bodies:

*Maximal Space = Energy = Minimal Form Vs.*
*Max. temporal form = Information = Min. Spatial extension.*

Since now we recognize geometrically energy or information systems, those morphologies classify as energy or information organs, not only carbon-life organisms that handle energy (limb, food) and information (brains, eyes, senses, words), but also other beings and atomic species - even 'deconstructed organs' that perform mechanical tasks of energy and information (informative cameras, lineal, energetic weapons).

Also, because according to the Galilean Paradox all motions are simultaneously still forms, form carries an active function and so we can classify any system both by its geometrical form and bio-logical functions as either an energy or informative system. In terms of a sentient Universe, this duality means that information is both a form-in-action and a sensation of still perception of a quiet world. Information and perception are thus simultaneous: information is a flow of software that ‘sparks’ the perceptive sensation in the hardware of a still system that process information, with a certain language. So particles that perceive light and gravitation, probably ‘sense’ light and darkness and move towards light, feeding on it. We

see the external action of feeding, the electron jumping and absorbing the photon, but the electron probably senses light and automatically moves to it, to feed, as your eyes move automatically towards food, even if you more complex brain can stop that automatic will that the electron always exercises.

Organic systems are ternary networks of information (head, nervous system), a reproductive body and networks of energy called limbs (trunk-digestive systems, legs).

For example, energy organs made of metal such as weapons, gas and electromagnetism are extended, fast, and lineal. There are metal-species of information such as microchips, money, cameras and radios. And they are small, fixed and complex in form. Yet only structures, which are balanced in energy and information become self-sufficient organisms. So only machines that put together energetic limbs and informative brains - robots - might become future 'organic metalife', in which the reproductive functions will be performed by the company-mother. The other machines will act as ‘gauges’ of information and ‘forces of energy’ do, without a vital will of existence, which is born by the capacity of a balanced ΣE⇔Ti field to switch between both arrows, acquiring a ‘minimal degree’ of organic freedom perceived as ‘vitality’ from an external point of view. Humans, galaxies, plants, robots - all kind of entities can be considered in that sense organic systems. Since living systems are born thanks to the complementary symbioses and synergies between energy and information organs that create together all kind of organisms.

This fact connects Physics and Biology in a new step towards the unification of all disciplines of science:

- In the microscopic scales, masses and charges, the flat energy of vacuum space, become transformed into cyclical vortices with height; while spatial, flat fermions become high, ordered, informative bosons. In our scale of matter spatial flows of energy (stars, gas), become transformed into cyclical vortices of gravitational information with height (black holes, tornados). Finally, in the cosmological scale, the energy of stars becomes transformed into black holes, whose spatial dimensions become time of ∞ height.

- In Biology, the first bilateral animal was a planarian worm that evolved rising to the informative height of man.

-Yet death erases information back into flat energy, in bigbangs that create planar Universes, or flat corpses.

The reason of the diffeomorphic principle is the holographic principle which implies the relative perpendicularity of all complementary systems with a body/field of energy and a head/particle of information: an energetic, concave geometry and an informative, hyperbolic topology, which fuse together, creating 4-D beings.

Ultimately what the paradox of Galileo (duality of time motions and spatial forms) coupled with the diffeomorphic and holographic principle means is a fundamental homology between dimensional form and function: *The 3±st dimensions of space of the Universe, length, width, height, and st-scalar, fractal size are equivalent to the 3±st motions of time, past=energy, present=reproduction, future=information and birth/death events of integration and dissolution.*

*Recap:* The Universe is local, relative, fractal, broken into ∞vital spaces, each one ruled by a point of information that absorbs it and creates linguistic maps, which it uses to direct the organic vital space or body of the point towards fields in which to feed, gauge more information and reproduce. Thus, the arrow of information is performed by a relative infinite number of broken, discontinuous points of view, complementary to the energetic fields/bodies they move. Yet information is limited by the volume a certain point of view can store, leaving outside an enormous quantity of uncertain information. Thus the Universe is a tapestry of broken, complementary organisms constantly fighting for more energy and information. MTS resolves many puzzles of science, from the Postulates of Relativity and Quantum Physics, to the causes of death and the morphology of living beings, physical entities and machines.

# THE 3±1 TEMPORAL CYCLES AND SPATIAL DIMENSIONS OF AN I-ORGANISM:

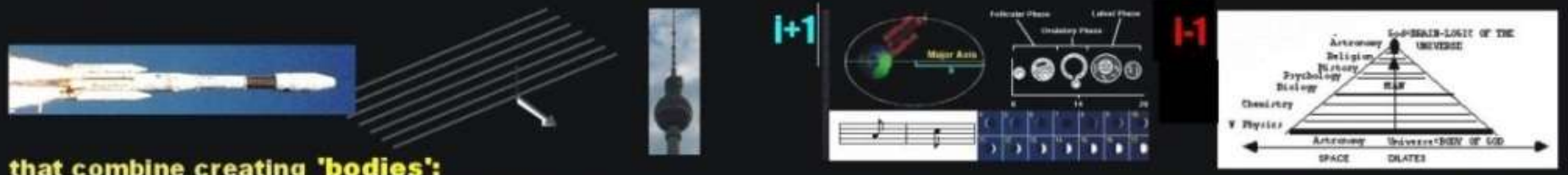
**ORGANISMS ABSORB, EMIT AND COMBINE SPATIAL ENERGY & TEMPORAL INFORMATION IN 4+i TEMPORAL CYCLES OF:**

Energy=Feeding Space=Reproduction Information=Perception, Time=Cyclic change and Fractal, Social Evolution

$\sum E_{i-1} > E_i$ $\quad$ $eti > \sum ETi$ $\quad$ $\prod ti > Ti+1$ $\quad$ $Ei > TEi > Ti$ $\quad$ $\sum Ti > Ti+1$

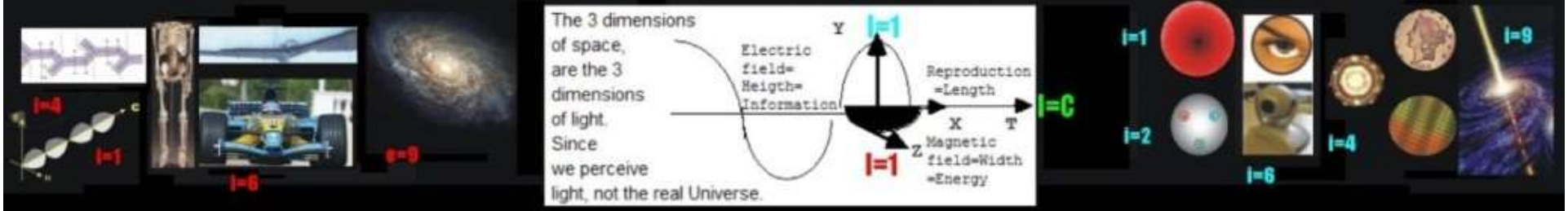
**PERCEIVED IN PRESENT SPACE AS THE 4+i PERPENDICULAR DIMENSIONS OF ANY RELATIVE QUANTIC S-T ORGANIC FIELD:**

Energy=Lineal Movement, Space=Width, Information=Height, Time=Cyclic Movement and social, fractal evolution




**that combine creating 'bodies':**
**planar, present networks of spatial energy :**

**and cyclical networks of temporal information or heads:**




**THOSE QUANTIC, RELATIVE SPACE-TIME ORGANISMS PUT TOGETHER CREATE THE CONTINUOUS SPACE-TIME PLANES OF EACH I-SCALE OF THE FRACTAL UNIVERSE, STARTING WITH THE THE LIGHT-SPACE MEMBRANE THAT HUMANITY PERCEIVES WITH ITS ELECTRONIC SENSES...**

**28. Vital dimensions: forward bodies & top minds.**

The creation and extinction of bidimensional, energetic space and temporal information explains the dynamic events of all scales of existence: As time curves energy, spatial planes acquire informative height and vice versa, the destruction of informative dimensions creates planes of energy. Particles of information are small, spherical forms/cycles, like your eyes and brains or an atom's proton or a black hole in a galaxy. They are on top of the system, where perception is 'higher' and show convex topologies of maximal form. Bodies of energy are bigger planes or lines that store energy to move the organism, like your body or an energetic weapon, moving forwards in the relative, diffeomorphic dimension of length. And so both, high information and long energy combine to reproduce a system in the z-dimension of width. The Universe has 4 time motions, which perceived in stillness (Galilean Paradox) create the 4 vital dimensions: energy is length; information is height; width, its product, is reproduction and time brings the arrow of organic evolution, as 'points of view' organize in bigger social organisms that 'survive better in time', because they have more energy and form than the individual cells. Thus, each of the main time arrows is defined for each local space-time as a diffeomorphic dimension that only reaches till the limits of the organism, but extends its action' further into the ecosystem or plane of existence in which the organism resides. In complex algebra, all this can be modeled with Partial equations of the total function of exi=stence, which define each of those 4 arrows, in a scale of increasing complexity and logic causality:

$$e, i, exi, \sum e \Leftrightarrow i.$$

The primary motion of all beings is lineal energy, in its relative direction of length, while the informative particle of any complementary system is on top, in the relative dimension of height. This leaves width as the natural direction for its re/product/ive, product equation: exi. Look at yourself: your height is your direction of information, your head is on top; your motion is forwards, in the length dimension of energy but your cells reproduce and multiply in the width.

All of us are knots of multiple cycles and arrows of time. So each of us is a multidimensional species. Complex beings, of course, do not follow exactly with geometrical precision those forms, because their vital functions must adapt to irregular ecosystems. Thus, perfect forms of energy and information exist only in the homogeneous, 3-dimensional ecosystem of interstellar vacuum inhabited by physical particles (and in lesser degree on water, life species, since water has complex motions and a general arrow of 'light information and energy' towards its surface).

For that reason, those geometrical rules of creation of vital arrows/dimensions of time/space, which are known to mathematicians as the product laws of vectors, are used to describe many operations between Time Arrows in the simplest geometrical systems of physical space: For example, light has 3 perpendicular dimensions. And Maxwell found that the product of the magnetic, energetic, flat field, given by the magnetic constant of vacuum (which is a membrane of light space) and the informative, electric, 'high field' constant, gives us the reproductive dimension of speed of the light wave. Further on since light-space is the ultimate substance of vacuum and light dimensions are time arrows of energy, information and reproduction, as unreal as it might seem to you, the 4 dimensions you see are not abstract concepts but vital time arrows, reason why they suffice to explain it all.

What is the speed of those time arrows and its frequency? The question is the key to unlock the complex synchronicities, quantitative laws and Vital and Universal constants of each species of the Universe, so it requires specific, detailed analysis of each entity, organic system or plane of existence, but certain general laws apply to all systems, due to the causal chain between those 4 arrows, as energy appears first, then it becomes bended and broken into information, whose product

reproduces a field and finally the re-organization of self-similar reproduced forms creates a more complex super-organism.

*Fast and slow dimensions of space and time.*

Further on, we classify the 2 dimensions of information, cyclical rhythm (discontinuous frequency) and height, as the fast and slow dimensions of time, since height is often the accumulation of cycles of time one over another, which become in still space (Galilean paradox), cellular bricks of a sensorial system.

We classify the 2 dimensions of space, length and width as the slow and fast dimensions of energy, since width is often the reproductive accumulation of lineal speeds side by side, which stores in still space (Galilean paradox), new energetic cells:

- Length is a fast dimension that moves ahead a Non-E Point and gives it speed. All bodies follow a lineal inertia in its motions, signalled by its relative 'length or body orientation'. Thus, length is the arrow most often associated to the concepts of energy, expansive destruction and devolution. It also follows that the absence of memorial height in an organism, is the key to increase its speed as it diminishes its dimensional friction moving forwards and the quantity of form it has to recreate in each 'fractal step' as it imprints its information in the lower scale of reality. And so the fastest known force with zero height and maximal linearity creates a perfect lineal motion of $\infty$ speed and 0 form: *the gravitational space over which the forms of light are imprinted whose speed is: $v=e/i=\infty$.*

- Width is the slow dimension of space that reproduces or accumulates spatial energy from side to side. In current theoretical models, strings reproduce laterally, creating fractal spaces in the dimension of width. In our scale, people become fat and wide, as they reproduce their cells. *All beings reproduce their energy in the width dimension of space.*

We also classify the 2 informative, temporal dimensions:

- The fast dimension of temporal information is the speed of perception of information given by the frequency/ rhythm of a cycle, which determines the rate at which the system absorbs its pixels. It is the arrow most often associated to the concept of time; often defined by an angular speed or frequency, which defines a clock of time. Thus its parameter is the inverse of lineal time, measured in $t^{-1}$ units as a scalar number; and when we correct the equations of Physics in terms of cyclical frequency, a whole array of fascinating discoveries and solutions to classic paradoxes - from the paradox of Information (Hawking) to the paradox of Quantum vs. continuous time-space - become resolved.

- The memorial persistence of a certain form traced by a time cycle prevents the drawing of the next cycle in the same place of space, causing an 'Exclusion Principle'. So when the cycle repeats itself, it does so over the surface imprinted in the previous cycle, creating a tube of height, the second dimension of time, caused by the accumulation of cycles of information. Thus, the slow dimension of time is informative, morphological height, born out of the evolution of a species through aeons that accumulated informative cells in the height dimension. For example, the Universe was born flat in the big bang and now it is acquiring form, curvature; bilateral animal life was born as a flatworm that slowly acquired form, till rising to the height of man, the animal of maximal information; the first plants were algae that acquired temporal height; the Earth was born as a flat, rotating disk that became a sphere with height. Yet in duality, according to the Paradox of Galileo, events are created by the dual causality of formal, geometrical space and biological function. So a 2nd bio-logical cause is needed to explain why dimensional, informative height is all-pervading in the Universe:

The informative organs of a being are placed on top of its height to improve its perception of its territorial space: the human head, the speaker; the black hole of a galaxy, the photon of a light wave are all located on top of the relative energy of

their bodies to inform themselves on the location of its feeding energy. Thus, height is also the biological dimension of information and the arrow of future evolution in life, which evolved from flat worms into the human beings. Both time dimensions are dimensions of change. Yet the motion of evolutionary growth or height is minimal: it changes very slowly, through the reproductive, accumulative process of evolution; while the mere displacement of a cyclical, physical movement can act faster. The most complex arrow of time has the slowest dimension of change – evolution - which is shown as a change of form. Yet evolution sometimes doesn't create height but it is often a contraction of space, as individual parts converge into a whole, herd, wave or organism. The 4th dimension of social evolution is therefore the only dimension that seems 'static in space' as a 'form', which doesn't change from generation to generation.

So both geometries, cycles of time and planes of space are in fact bidimensional, adding up to create the 4 dimensions of space-time. Energy consists in an amorphous, relative surface of undifferentiated quanta, a plane without form – a network of small, cellular points, in which the creation of memorial time cycles imprints patterns of information and makes it recognizable as a complex system of multiple Time Arrows. Then, as the being develops those Multiple Spaces-Times, it acquires certain topological dimensions as an individual or as a species living in a longer time-frame.

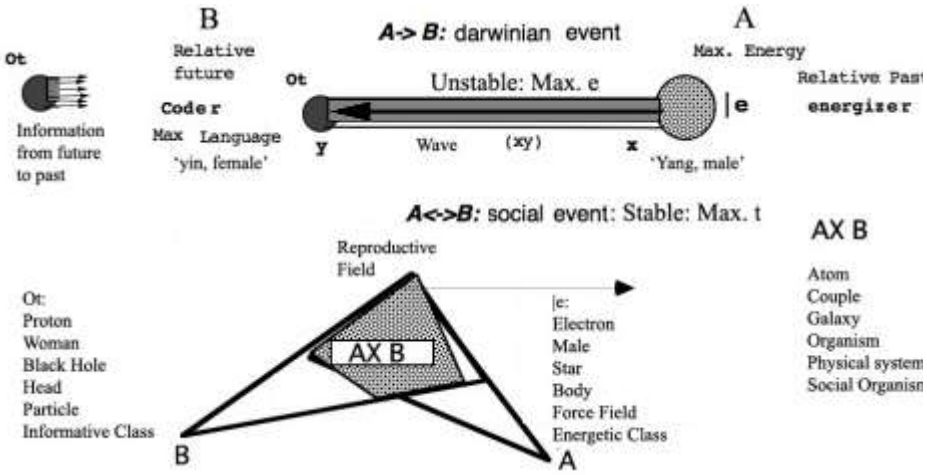
Yet organisms are dynamic entities that change their parameters of energy and information and so they also change their dimensions of space and time, often transforming a dimension of space-energy into one of temporal information and vice versa: A space-time field is created and destroyed through the interaction of the 2 dimensions of energy, length and width, and the 2 dimensions of information, height and rhythm. To that aim, the 2 dimensions of energy and information combine and transform into each other in dynamic events of dimensional destruction or dimensional reproduction.

Finally to notice that according to the Galilean paradox we can do a description that spatializes time or one that temporalizes space: In a 'ceteris paribus' time model of reality all dimensions of space become temporal, as form becomes form-in-action, in-form-ation - exactly the inverse of what classic physics believes, when it affirms that time is the 4th dimension of space, by converting time into a clock-like, cyclical form of space. In the temporal vision, it is the lineal motion and lateral reproduction of information what creates the 2 dimensions of space.

*Recap*. In physics space has 3 dimensions of form and so motion only occurs through a dimension of time. This is false. Length is often the main motion of any system that displaces its body/wave in that dimension. Width is a slower dimension of spatial change, often related to cellular reproduction. Frequency is the fast dimension of time that defines the clock-rhythm of absorption of information. Height also changes; it has motion albeit slower than length, the longest/fastest dimension. It is associated to social creation. So we talk of Time-space as the perception of the 4 dimensions/arrows of time in motion, where the slowest 4th motion/dimension, social height, given by the arrow of evolution is the only one that seems to us static. Thus, energy displaces mainly in the dimension of length; information in the dimension of height; width stores reproduced cells, and then there is a 4 dimension of social evolution.

All dimensions of Time-space have motion, a fact which can be observed in all the planes of form of the Universe, till arriving to light space, the simplest substance of the Universe, which in the model of Time-space has also 3 obvious motions – magnetic width/energy, electric height/information and length-speed/ reproduction, and a 4th, less obvious time-change dimension of social evolution, represented by color.

## 29. The Generator Equation of the Universe.




*In the graph, the interaction between fields of energy and particles of information, either in Darwinian events in which the most complex form normally absorbs the energy of the bigger one, or in complementary events, which create a stable system of energy and information, explains most events on time and forms of space of the Universe.*

In the graph, taken from more detailed analyses of the interaction of knots of time arrows in their processes of creation of a certain topological plane of existence=organism, we can observe how arrows of time interact, creating flows of energy and information that shape fixed cycles, which seem to us (paradox of Galileo), stable structures that anchor those points of view into a stable region of existence.

The equation that defines those events between energy and information arrows is common to all sciences, known as the *principle of conservation of energy and information*. It explains the 2 simplex Time Arrows of the Universe, which as the graph shows are at the heart of most events of the Universe.

*'All what exists is a type of energy that trans/forms itself back and forth into a form of in/form/ation'.*

This Law fusions the principle of conservation of energy and information, the 2 main laws of all sciences. We call the creation of energy the arrow of energy, one of the two primary arrows of time in the Universe, or 'entropy'; and we call the creation of form, the arrow of information, the second primary arrow of time, which in physical space happens in masses under the 'informing' force of gravitation that creates 'bidimensional' and 'tridimensional vortices' of space-time, according to Einstein's principle of Equivalence between mass and gravitation – hence systems with more formal dimensions than simple, lineal forces; or complex formal 3-dimensional warping in life systems (DNA, protein, dimensional warping which store the complex form of life). Thus, again we see that systems apparently so different as physical mass or biological molecules do use 'formal dimensions' to store the information of their systems; while in other events employ lineal forces and lineal 'fat' molecules or lineal limbs to store or display energy. All what exists are processes that create information or entropy or its complex combinations (reproduction and social evolution). Since Reproduction, e xi is born from those simplex arrows, and social evolution follows by the self-organization of self-similar reproduced beings, it follows that the main Law of science is also the proof of the Law of Existence and its 4 arrows. Since this law is the main Principle of all Sciences:

*'All energy becomes trans/formed into information: $\Sigma E \Leftrightarrow I$'.*

This can be expressed with a *Feed-back equation of energy and information: $E \Leftrightarrow I$ or $E \times I = K$ (dynamic/ static)*

Since all is Time=Motion=Change and space is just a static slice of time we call $\Sigma E \Leftrightarrow I$ the generator, feed-back equation of Time-space: Those $\Sigma E \Leftrightarrow I$ *cycles* generate the events and trajectories of each and every part of the Universe. Where its 4 elements describe the 4 arrows/motions of time:

*$\Sigma$ (social evolution) Energy < (Reproduction)> Information.*

Further on, those 4 elements become the parts of all physical or biological systems, when we perceive them in a static 'dharma' or moment of 'present':

*Σ (cells/waves) of Energy (bodies/fields) X (particles/heads) of Information =Complementary system.*

Thus the Generator Feed=back equation of Reality also represents the species of the Universe. Its complex study, carried out by General System Sciences, requires the use of Non-Euclidean Geometries to define the topology of each part of those 'knots of Time Arrows' that act as 'reproductive bodies/fields' and 'informative heads/particles' of any exi, complementary system; and the development of a complex causal, 'non-Aristotelian' logic to define the order and interactions of those arrows. Since the 'parts' of each whole knot of time will have functions defined by the needs of any system to gauge information, absorb energy and reproduce.

It is also clear than in all those organisms the fundamental element, the center of power, is the brain-head and its languages of information, which control the body of energy and shape the form of the organism. They set a selfish dominant time arrow towards the growth of information, which is the ultimate cause of the cycle of life and death of all organisms that end up in a 3rd age of excessive form/information, as they warp all the energy of the system.

This fact also explains the relationship between information and future - the most difficult dimension of time to understand by mechanist science since we do not see the future, as we see spatial geometry with our machines.

Yet the future already exists in the realm of complex, bio-logic thought, as we will all warp our energy into information and die; and as a species we will always evolve into more informative beings in the future that will feed on the energy of those entities that don't evolve and die. Let us then consider those systems of time knots, adding the concept of a causal order between its arrows of time from past to future.

R*ecap*: The holographic principle (bidimensional energy and information) allows the constant transformation of energy into form and vice versa, E⇔I, creating the fundamental principle of science, the principle of conservation of Energy and Form: 'All what exists is energy that trans/forms back and forth into information'. The formalism of those 2 arrows of time gives birth to the generator equation of time, Σ *E⇔I, which defines all species of the Universe as self-repetitive fractals of energy and form.*

**30. Universal Constants are ratios of energy and form.**

*Definition of universal constants.*

The previous analysis of the generator equation of the Universe brings an essential element of all formalisms of physics, the meaning of Universal constants and the key complex parameters of science, measures that combine energy and motions such as speed or momentum, which are conserved as complex 'time arrows' and show certain constants in each specific species, which are the vital and universal constants of biological and physical, complementary beings.

We thus can define Universal constants and complex parameters of science as ratios between the energy and information systems of a certain 'space-time membrane' (the bigger organic structures of the universe, the light membrane and the gravitational membrane, origin of most physical constants), or complementary being (the constants of mass-information, momentum, the social constants that measure the number of particles and field quanta put together to create a physical entity; the vital constants that are ratios and proportions between the energetic reproductive and informative systems of living beings, etc.):

*'Existential constants are ratios between the energy and information parameters of any system of reality. Universal*

*constants measure those ratios in the more extended systems, the membranes of the Universe, its quanta and fundamental particles. Vital constants measure those ratios for specific biological beings.'*

*Simple, social numerical constants.*

Let us consider the main of those constants:

-Social constants of space, which define the number of cells that form an efficient spatial structure. They tend to follow pairs, as 2 is the natural symmetry of left-right of bidimensional space.

- Social constants of time, which define the number of events needed for a transformation or completion of a time cycle; the most common of which is the number 3 of past-energy horizon or youth, present, reproductive state of the event and future, informative state.

- space-time constants, which combine both spatial symmetries and temporal events; Pi belongs to this concept as it is a self-similar number to 3, with 'small' apertures between the 3 cyclic elements or phases of the cycle, which taken as a single picture of space-time form the spatial shape of the cycle when perceived in space.

Yet the most important of those numerical constants is the number 10 or tetrakys, the perfect social number that creates a unit of the higher scale with 3 x 3 energetic, reproductive and informative elements, and a $10^{th}$ central point that 'emerges' to become a unit of the next scale.

Among those decametric scales, made famous by Eames in his film 'potencies of 10', it is natural to consider the 'scale of all perfect scales' $S^t$ to be $(9\text{-}11)^{9\text{-}11}$ systems; that is groups of 9 to 11 spatial units organized in 3x3=9 to 11 scales of growing social complexity. And indeed we find that number to be extremely common to the point that we could consider it the ultimate number of scales of the complex universe between the fractal entities humans perceive (atoms and galaxies, unified in fractal, complex physics as self-similar forms of the quantum, electronic and gravitational, cosmic membrane): We find it as the difference of force between those 2 membranes (electromagnetism is $10^{4x10}$ times stronger than gravitation). Then $10^{11}$ atomic ties make a DNA molecule; $10^{11}$ neurons make a brain; $10^{11}$ humans have lived in this planet; $10^{11}$ stars form a galaxy and $10^{11}$ galaxies make up the cellular Universe.

In that regard, Einstein said that the ultimate Nature of Universal Constants could not be 'physical values' but special numbers, which would be 'relationships' between substances that constantly appear in Physical equations, 'like pi and e'. And he was right.

*Existential parameters: reproductive speed and momentum*

On the other hand, the simplest algebraic operations between energy and information parameters become the essential 'complex parameters of the Universe and all its species':

*Speed = V=s/t=spatial energy/temporal information.*

Speed is in complex science no longer a mere measure of the translation of a form but in detail, all forms (paradox of Zenon) move not, but reproduce its form, step by step, as a wave of light does. The wave affects a lower scale or network of relative energy, making it to adopt its formal configuration. So form becomes reproduce, imprinted along a previous scale of reality and motion becomes reproduction. Light reproduces over the simple energy of gravitational space and the wave displaces. A wave in the water does the same imprinting one after another the form of the network of atoms and so on. So it follows that the systems which are simpler with less information move faster because they have to imprint less form. And so V=s/o information=infinite, which is the perceived speed of gravitational space whose information we do not perceive, while the more complex life structures move slow as they have to keep its huge amount of stable informative shapes unaltered. And each 3 months we change all our atoms

to reshape our form.

So we call the new parameter, 'reproductive speed' as we consider that motion is a manner of reproduction of form.

*ExI= Momentum or existential force.*

This is the second key ratio of reality which multiplies the energetic and informative strength of the system. In physics is equivalent to momentum, mv where M(i) is a measure of cyclical form, and V(e) a measure of motion, the definition of energy in this work. In biology measures the top predator power of the system which will dominate its ecosystem when it has the strongest energy body and the more intelligent informative brain.

And each species will have a certain existential force, reproductive speed and energetic, ∑ and informative ∏ social parameters, which will be its 4 'main numbers, needed to define the form (from the quantum numbers of physics to the vital constants of living beings – metabolic constant, brain/body ratio, brain volume, physical strength, etc.)

*Irrational constants.*

Because arrows of time are back and forth transformations of energy into information or its combination to reproduce together a self-similar form, and certain numbers define certain 'efficient' social geometries, there are Universal constants, which define for each species of the Universe a given ratio of transformation of energy into form or a reproductive ratio that combines two simpler energetic and informative bytes and bites to reproduce a new form (h constant, c-constant, etc.)

The dynamic relationships between the 2 motions of the Universe, energy and information are invariant in form, motion and scale; therefore fluctuating around fixed equilibrium values, which is the ultimate meaning of Universal Constants.

Thus, all of them can be reduced to the generator equation of the Universe, the feed-back cycle of energy and information, from where all laws of reality can be derived:

*Energy <=> Information; ExTi= Irrational Constant*

A Universal constant cannot be a perfect number, because it will create a fixed Universe; thus Universal constants are irrational numbers, which show a minimal fluctuation. Consider for example the main constant of the Universe, pi. If pi were exact then the spiral made with 3'14 lines would not be a vortex but a perfect, static cycle. Yet if pi is either +pi or –pi, the cycle will not close by defect or close in excess. What this means is that the cycle will be a bit more curved inward, and so it will be an informative cycle; or it will be cured outward by defect and so it will be an expansive, energetic spiral.

We know, for example, that the orbits of planets are decreasing by a few centimeters a year, so they will finally fall into the sun. They are, if we consider a dynamic, temporal view of them, inward, informative spirals. Yet an antiparticle, which is exploding information into energy, 'dying' in a big-bang that annihilates it, is bending outward.

So irrational numbers are the absolute constants of the basic exchanges and transformations of energy and information of the Universe. The main ones are:

- Pi, the formal constant of creation of in/form/ation. Since pi transforms 3 lines of energy into a ternary cycle with one more dimension of form: a string of 3 lines with 3 dark apertures for a total 0.14. Within those 3 lines there is a $2^{nd}$ dimension of height, or information and a volume of space. The entity has grown

- Phi, the Golden Ratio, which is the constant of reproduction that multiplies an organic system into self-similar forms.

- e, which is the constant of extinction of form back into a lower scale of energy that devolves a formal being into its cellular subspecies. Its most common ternary form is et=3=20.

We find those constants, both in physical and biological

processes related to those transformations of energy and form – showing the fundamental equality of all Universal Systems.

For example, *e* appears in the decay of radioactive atoms that release energy; phi appears in the organization of a sunflower spiral; pi appears in the h-constant of transformation of light flows into electronic actions.

How many Universal constants there are for any system? We advanced 3 basic U.C. at the beginning, pi, the ratio of creation of information, phi, a reproductive ratio and e, an extinctive ratio of destruction of information into energy. And indeed, all systems have at least those 3 basic constants.

*Vital Constants: proportions between brains and bodies.*

A final type of constants expresses quantitative proportions between the reproductive body elements and informative particles/heads of a complementary system. As a general rule the commonest proportions of energy/information are:

- The particle/head of information is dominant in information parameters, (dimensions, mass-weight or number of network connections of the informative system, cellular density, etc.), in a 3 to 1 proportion with the body/field of energy, both in time (so in genetics, the dominant, informative element has a 75% chances and the recessive element, 25% chances); and in space (so the Universe has 76% of dark mass).

- In terms of spatial, energetic parameters however the body is dominant (spatial dimensions, cellular numbers, energy volume etc.) usually in a proportion of 90-80% to 10-20%. This is due to the fact that the informative element tends to be the central 1-element of a body tetrarkys, so we have a captain every 10 sergeants and a sergeant every 10 soldiers; 9 glial cells that give energy to every neuron, a 10% of taxes that go to the Middle age Priest, which directs the herd of believers, and so on. Yet another simpler, very common dual structure is a spatial square with a central knot, which gives us a 20% of informative elements (the center) and an 80% of energetic elements (the vertices of the square).

*Recap*. The generator equation of space-time and its 4 main arrows of time, understood as symmetric transformations of energy into information or reproductive combinations of both, coupled with the invariance of topological form, scale and motion of the universe explains for the first time the meaning of universal constants.

### 31. Inverted constants: The chip/black hole paradox

The inverted properties of energy and form, shown in the law of Range, apply also to any complementary system of the Universe. So smaller animals have faster metabolic rates because its energy /form cycles are faster. Their 'clocks of time', we could say move faster. Further on, in complexity this implies that paradoxically the smaller beings have more information (chip/black hole paradox). So the smaller the chip is the faster it calculates. This paradox is essential to understand the dangers of black holes. Precisely because they are so small they will reproduce faster and accrete faster, in the same manner a smallish virus reproduces much faster and it is more dangerous for an organism than a bigger bacteria.

If we adopt according to Galileo's paradox a static point of view, universal constants are NOT only algebraic values, but invariant geometries that repeat in all scales of reality. And this is the ultimate meaning of General Relativity, since Einstein made a precise, simultaneous, present measure of the 'static form' of those vortices of mass obtaining G as a measure of the relative curvature of the gravitational force in each point of the vortex.

The central concept of a Fractal, scalar relativistic Universe is obvious: the same invariant game, the same forms, the same motions, happen in all the scales of reality. And so the Universe is relative and invariant in its energetic motions (original Theory of Relativity), in its forms (cyclical forms of information and lineal energy) that repeat in all scales, which therefore are also invariant.

We have seen now how that invariance is played as a 'ratio', ExTi=K, which allows smaller beings to live shorter but live faster. As we have seen the properties of energy and information are inverted. So the smaller we become the faster we rotate, the faster we live, the faster we beat. For example, we know that a fly sees 10 times faster than a human being, reason why we cannot catch it. Yet the ant who lives longer lives 7 years × 10 times faster=70 years of inner, subjective existence.

The same concept applies to a physical vortex of information, V(t) × R(s)=K than to a living being that processes energy into form (a mouse beats its heart faster than a human; a cell divides and reproduces faster than a mouse, every 24 hours, etc.).

The entire cosmos and all its scales are related by that simple paradox: the smaller we become the more information we process. It is the Moore Law: the smaller the chip the faster it thinks. The reason is obvious: smaller, faster systems, close 'logic cycles' of information faster. In complex beings it means faster thoughts in smaller neurons, packed in tighter groups. In the physical world, the bigger rotational motions of cosmic masses are slower than the cyclical rotation of particles, but their product remains constant. And we can write this fundamental law of the Universe, with multiple self-similar applications in any entity made of fractal space-time, again as a general case of the generator equation:

*Universal ExTi = Universal Space Extension × Time-frequency = Constant Entity = K*

An expression, which appears in all scales of reality (Heisenberg Principle, Vital Constants, etc.)

*Recap*. The Universe is just and harmonic: small beings are more intelligent, faster than big ones. It is the paradox of David and Goliath; the paradox of the chip, the paradox of the black hole…

## VI. THE EXHAUSTIVE MODEL: 9 TIME ARROWS

### 32. How to connect space-time cycles with metric spaces.

However, according to the Principle of Correspondence, each new wider, more comprehensive model of reality must include all the cases of the model it substitutes. So while a 4-dimensional description of multiple space-times suffices in itself to give meaning to reality, it appears unconnected with the previous paradigm of metric spaces, reason why we must achieve a more detailed analysis of those cycles and give them specific mathematical operations, as to be able to connect them with the 3rd paradigm of metric spaces, its geometries and mathematical algebras. This is done at two levels:

-By describing them with a higher form of geometry, topology.

-And by describing more precisely the 4 arrows of time, subdividing them in more specific types of events and adding precise algebraic operations to each of those cycles.

Let us consider briefly those 2 elements.

*Recap*. To fulfil the principle of correspondence multiple time-spaces must be able to connect the why of the cycles/arrows of space-time with the precise geometries and algebraic measures of the metric paradigm.

### 33.Topology: informative, energy & reproductive systems.

Some initial precisions though are needed. Today information is not understood as 'form' but measured, as it corresponds to the science of metric spaces, since Shannon, by considering frequencies and patterns in one dimension. But here in/form/ation as the name indicates is given by form. So Shannon's analysis of information is correct but explores only patterns of information in one dimension (such as the information carried by the frequency of a wave). If you have though 2 dimensions you can square the volume of information you can store and transmit. And in 3 dimensions you get a cubic quantity. And so we observe that most complex systems

have at least 3 ‘levels’ of complexity in the creation of information. So lineal proteins fold into bidimensional membranes that fold into complex 3 dimensional patterns, which are in fact the active information.

A second prediction regards the function of certain simple bidimensional forms. The line is the shortest distance/motion and so it is the main form of energetic organs, from cilia, to legs to light fields. The cycle stores the maximal information and so it is the usual organ of information, from cameras, to vowels to eyes.

Yet when we consider more complex topologies of information, we talk of hyperbolic spaces that store information and are basically a complex ‘sum’ of chained cycles, often forming a tube of height, and so your head is at the end of your height and antenna is at the top of height. And height becomes a dimension of information.

When we consider energetic systems, normally they are external membranes that protect with its strength and filter the energy of the external world. And so because they enclose the system, they are normally made of tiles, squares, hexagons that put together cover totally the space; they are a sum of planes even if the total sum might appear sometimes as a spherical form and in topology they are call spheres. Finally the cycles of reproduction are toroidal cycles that come and go from the informative center to the energetic membrane, combine both and reproduce the system.

The 3rd type are reproductive topologies that combine the other 2 arrows - become the 3rd complex arrow of time.

Yet if those 2 simplex arrows shall explain it all, we must combine them further, realizing that ‘from 2, yin=information and yang=energy, comes 3’, since ‘the game of existence combines yin and yang into infinite beings’ (Cheng Tzu). Indeed, philosophers have always known that reproduction combines energy and information into self-similar beings. And the 4th paradigm will show how all complementary systems of the Universe, from the simplest particles, quarks and electrons to the more complex, humans and perhaps universes, reproduce their form by combining their energy and informative organs and systems, repeating them in another discontinuous location of space and time.

So there are not only 2 simplex arrows of energy and information but also a complex arrow that combines both, Energy ⇔ Information: the Reproductive arrow. And again, while there are many different ways to achieve that arrow; we observe always that an energetic, lineal, topology (since the line is the shortest distance/motion between two points, the simplest energetic systems are lines, or planes), and an informative topology (since cycles are the perimeters that store more information in lesser space, informative organs, are cyclical) mix to reproduce. So men are lineal in form and are the energetic sex, and human are cyclical and are the more perceptive sex, and both combine to reproduce. Machines are reproduced by humans which are the cyclical, informative component that forms the raw materials or energy to make them. And so on. Because it is an obvious logic consequence of the discontinuity of vital spaces which are finite and the limited length of a time cycle which always ends, that to survive species must reproduce or else its logic form perish.

So the Universe is ultimately an organic system of reproductive systems of energy and information.

Thus, once we establish the 3 topological regions of any system, which is their why we can add more detailed measures and convert each topological space in a specific species of reality connecting the why and the when of the metric paradigm, fulfilling the Principle of Correspondence.

*Recap*. The 3 dimensions=arrows=cycles of space are the perpendicular 3 topologies of the Universe: the function/form of energy, the function/form of information and the function that combines them, e xi, of reproduction. Those 3 dimensions define all

topological spaces, and space is the sum of all of them, organized in Non-Euclidean systems.

**34. Generator equation of space-time: 9 dimensionality.**

On the other hand, to be able to connect specific equations of detailed metric analysis with the general equation of the 4 arrows of time we have to descend into an exhaustive detailed analysis of those arrows, dividing them in sub-arrows specific of each discipline and defining those arrows with concrete operations used in metric spaces.

Moreover when we observe things in more detail, we must break reality in multiple subcomponents that assembly wholes in parts, reality become more complex. And this again seems counter-intuitive. Because as set theory shows the whole is simpler than its detailed parts. So if we follow the integrative path from parts into wholes thing simpler and at the end we end with 2 simple concepts, the physical Universal body and its Mind god.

This in the rest of this introduction to multiple space-times, after making a very brief, simplified account of it all in the previous pages, we are going to try a tour de force: to resume it all, which will be latter developed in more extensive lessons, departing from the simplest parts into the whole, by showing you all the arrows of time and topologies of space from the simplest events and geometries to the more complex, from the primordial parts or 'simplex arrows' of space-time, into the organisms of reality or 'complex arrows, and finally into the absolute whole Universal body and mental God, or 'universal, transcendental arrows of time'.

Those 3 scales, from the simplest actions of abstract spacetime into the complex organisms of vital spacetime till reaching the absolute whole, are the 3 stairs we need to make sense of all. In each of those stairs we shall define 3 arrows of space-time for a total of 9 dimensions and that is all you need to create the Universe: the simplex, complex and transcendental arrows/ cycles/dimensions of all realities.

This is possible to do when we realize that the complex arrows of reproduction and social evolution manifest themselves differently in physical, biological and sociological entities, 'decoupling' themselves in ternary events, 'actions' that reproduce waves in physical space, 'palingenetic offspring' that reproduce biological species and so on. So in the more complex division of the arrows of time, we talk of 3 x 3 cycles/dimensions of space-time, which we group in 3 types:

*Physical, spatial arrows*:

Physical entities are complementary entities, which:

- I: In its particle state gauge information.

-E: In its wave state feed on energy.

-exi: And together reproduce actions, either by emitting a self-similar fractal part of energy and information, called an 'action', used to communicate with other entities (a Universal constant, such as h) or by moving towards a position the particle has gauged. And so we define 3 physical arrows or dimensions of space: gauging information, i; feeding on energy, e, and reproducing actions by combining them, exi. We call them also dimensions of space, because the light-space in which we exist has 3 Euclidean coordinates that correspond to the informative, electric field, the energetic, magnetic field and its product, the reproductive speed of light.

And it is a well-known fact of science (Maxwell equations) that the speed of light can be found by multiplying the magnetic and electric constants of light, thus showing that indeed, the algebraic operandi x connects the why of the simple arrows of space-time in physical entities with the specific equations found in the metric paradigm.

Thus one of the most fascinating facts of the Universe is the fact that departing from 2 simple entities, lineal energies and cyclical informations, which create spatial planes and clocks of time, we can explain it all by combinations, repetitions and transformations of those elements. A further precision though

is needed on the difference between classic operandi such as equality and the new, evolved, dynamic operandi of self-similarity proper of multiple space-times in constant transformation; since most people tend to call each thing by a single name and see things in a static manner. So the paradoxical transformations of a reality, which suddenly become its opposite, break their 'Aristotelian mind' and one-dimensional perception of space and time.

Consider the famous equation, $E=Mc^2$, which in the so-called Planck notation, where light speed is the unit, writes E=M, and since a mass is an attractive whirl of space-time with a cyclical form, it can be defined in terms of time clocks, or in terms of information, as the fastest it turns, the more informative frequency it has, and the more it attracts, as all whirls and hurricanes do. So, we can write it E=M(Ti) or simply E=Ti.

This is meaningless because Energy is not mass or information but exactly its opposite. Lineal energy though can curl and create mass, especially when it goes at c-speed, its limit of lineal motion and so it deflects the remaining energy into a cyclical form of mass. And vice versa, a mass can uncoil and create energy. So energy can be transformed back and forth into mass and the proper way to write this equation is E⇔M(Ti). And yet our mind prefers the concept of equality. And physicists will tell you that energy and mass are equal. The proper word though is self-similar, a word used in fractal geometry, which topologists that observe self-similar beings understand much better. Thus the 4th paradigm is a change of 'chip', of state of mind, of the way we think, which makes it so difficult to penetrate, b*ecause the human mind is a simpler structure of thought, more accustomed to fix forms into visual concepts that see the complex, fractal, transformative reality.*

*Social, organic, temporal arrows*

$\Sigma e \Leftrightarrow -\Sigma^2 i$; $\int\partial$: Most systems however create stronger actions by gathering multiple energetic cells into herds and waves, which create bodies and by gathering multiple informative cells, into complex social networks.

The difference between herds and networks is the degree of communication, since each element of a herd only relates to its neighbours and a network relates to all other elements of the network through a huge number of communicative flows.

This makes necessary to distinguish between the operandi of both types of social groups in a more precise manner that our simplified 4-dimensional equation where we used the sum and multiplicative operandi to represent a wave/herd and a network. Since we want to be able to relate those operandi to specific equations found in the use of metric spaces.

Thus, while we keep the sum symbol for herds, Σ, we use its square or more precisely its negative square or imaginary number, $-\Sigma^2$ for information. Further on networks of information such as your neuron normally have a second scale of 'sub-networks', which are the flows of communications, or axons that join them to all other elements of the network, and it is easy to prove that if any point is connected to all the other points of the network, as well as to himself, the number of axons of the network will be the negative square of its sum, $-\Sigma^2$. The a negative symbol also stresses that the properties of energy and information are inverted; and the organic, informative network absorbs its energy from the body network, subtracting from the total force of the body the energy it requires, as the brain does, without giving back anything but informative orders. Thus informative networks are represented by imaginary numbers, in the complex plane, as it happens with fractal generators that have a real and imaginary term or in the representation of the phase wave of electrons, which have a real number that represents its energy and an informative value represented with imaginary numbers. The same concept applies to the understanding of the equations of special relativity in which the parameter of temporal information is multiplied by a negative square, as light-space

contracts the gravitational space in which it draw its forms. Thus again, a more precise algebra of the cycles of energy and information allow us to connect the why of multiple space-time cycles with its detailed description and equations in metric space.

A more sophisticated operandi to study networks is the duality between integration and disintegration (derivative symbol) $\int\partial$. Let us consider for example, the simplest duality: $\partial\sum^2=2\sum$.

If we consider a complex system with an informative head, a network of neurons, $\sum^2$ in charge of the limbs and body cells, which tend to be in equilibrium (Re=E), in as much as the energetic system provides the elements to the reproductive system or moves it (being the informative system much smaller in space), then the derivative of $\sum^2=2\sum$ means the network will codify with its instructions both the body and the limbs. If the system was simpler – an energetic/information systems, then $\sum^2(\text{neurons})=\sum$. This in Theory of Information gives birth to a key law: 'the number of informative instructions needed to integrate the parts of a system into a whole is the square number of its parts', with wide applications that range from epigenetics to industrial design.

Thus again we can see how the more general laws of the 4th topological paradigm, when studied in detail give birth to the specific laws of the 3rd, metric paradigm.

Finally both come together into complementary organisms, and combine their body and brain structures to reproduce themselves. And so there are 3 organic arrows: the creation of energetic waves, Σ; the creation of informative networks, and its combination in reproductive events or organisms, ⇔. Where ⇔ must be substituted by different algebraic operandi depending on what kind of system we describe. So in the example of a phase space of an electron will be a sum, +, but in a Darwinian process in which an informative cellular system or herd of top predators feeds on a field of energy or prey, it could be a division, as the 'food pie' is divided into the members of the herd and so on. We thus keep as in the case of topological spaces, a minimal degree of flexibility to be able to accommodate the multiple cases in which an informative network and an energetic herd or reproductive body enter into an act of communication.

Since the processes of organic evolution - the formation of herds and networks and its reproduction – contracts space, tying together individuals into groups, and requires a long period of time, those 3 arrows that need languages of informative communication can be considered to be dominant in time. As indeed, 'time curves space', and 'time evolves the morphology, the form of beings' (Einstein, Darwin).

*The fractal arrows of multiple-space times*

Finally we can talk of the fractal, transcendental arrows of multiple space-times, which were unknown in the age prior to the scientific revolution and have been looked at with wishful blindness by scientists, due to their dogma of a single clock-time and a single continuum space. They are however self-evident when you change your 'frame of mind' and see reality as it is, without those 2 dogmas of mechanist science:

The Universe is made of an infinity of those organisms, which generation after generation repeat themselves in time with small variations; or gather together into super-organisms, so particles evolved into atoms, which evolved into molecules that evolved into cells and planetoids that evolved into organisms and planets and galaxies and the Universe. And so we have 3 more arrows of time to complete the Universe: *the generational arrows* of species that go through a life-death cycle once and again between birth and extinction; *the transcendental arrow* that creates super-organisms with smaller super-organisms; and the *ecosystemic arrow*, which adds all the super-organisms and generations to create entire worlds and the Universe itself, which could be considered an ecosystem of complementary organisms of energy and information.

To represent them with algebraic symbols we shall call the previous equation, $\Sigma e \Leftrightarrow -\Sigma^2 i$, that defines a complementary entity of energy and information, spread in a single space-time 'membrane', plane or continuum as X. Then we define:

- $\int \partial$; e⇔I'; G; $e^g$: *Integration in time of multiple organisms.*

*The generational arrow/cycle* of existence is relatively easy to represent, since all forms that live have a given order: they pass through an energetic youth, Max. E x Min. I, an age of maturity in which the being reproduces by mixing energy and information, e=I, and an informative age, when it warps the rest of its information, Min. E x Max. I. Then in the moment of death the system explodes back, devolving its information into energy. For that reason, we can also use the symbols of integration and its inverse derivative symbol of disintegration. Since ultimately an organism is ruled by the existence of an integrative network in control of its energetic limbs and/or body in complex systems. And for that reason we die when our informative, integrative network or 'brain' dies.

Yet those ages are dynamic and so we can use the ⇔ symbolism, to represent them all, whereas E< is the age of energy, ⇔ the balanced age and >I the age of information. And consider that the arrow of life is e >I (warping of energy into information) and the arrow of death is I<e, its reversal. Those simple equations in the static and dynamic form will allow us to explain many systems with inverted parameters, such as particles (life arrow of physical species) and antiparticles (death arrow). Thus again we can relate the $4^{th}$ , why paradigm with specific entities of the metric paradigm. E=I, will become also the equation of beauty, as we perceive naturally beautiful a balanced form of energy and information and since the product exi or action is maximal when e=i, beauty becomes merely the expression of the most efficient, top predator form in which body and brain, energy and form are in balance. Thus again, we can obtain basic equations for fundamental processes of existence never before represented in algebraic form, such as life, death, beauty, top predator or existential force.

Finally we can define the generational arrow as the sum across time of all the generations between the birth of a species or living cycle and its extinction. And so if we call G, the number of generations, any statistician knows since Fibonacci that the function $e^G$ is the most common number of reproductive generations that will exist after a number of G generations. And from that simple equation we connect with the extensive field of Volterra equations and other works of metric spaces regarding statistics of populations that will fine-tune the whys we have found in the $4^{th}$ paradigm of multiple space-times.

According to each specific species and type of analysis we shall use any of those operandi after careful consideration.

- $\sum$, $\prod$: *Integration in space of multiple organisms*. *The existential, ecosystemic or world arrow.* Finally if we represent a complex ecosystem as a series of super-organisms and fractal parts integrated into a whole we reach the final goal of explaining it all either within a world or ecosystem or the Universe taken as such. What operandi shall we use for this final arrow? A careful analysis of the interactions happening in each ecosystem will give us a combination of all the previous arrows, as each ecosystem will have herds, networks of interrelated species, top predators with closer social relationships, several planes of existence, etc. So in this final scale of reality it would be preposterous to pretend we have a 'metric equation' able to represent all the ecosystems of reality and the absolute. But if we consider two separate terms, one for organisms and territories related as herds and one for those related as networks, we can write, with two 'enlarged' symbols of sum and multiplication, which turn out to be merely the more complex operations of derivation and integration:

$$\sum(\Sigma E \Leftrightarrow -\Sigma^2 i) <=> \prod(\Sigma e \Leftrightarrow -\Sigma^2 I)$$

On the other hand, for the astro-physicist mathematically inclined we shall show in our work on physical spaces that the Universe and its main cellular galaxies, can be studied as an organism made of two networks, one of gravitational information (dark, gravitational energy and dark, quark matter) and herds of electromagnetic spaces (stars, electrons, etc. And so its equation would be self-similar to that of an organic system. On the other hand if we were to calculate the n=st number of total scales of reality we shall see that they seem to tend to infinity and so the equation of the Universe as a fractal organic system would be:

$$\sum(\Sigma E \Leftrightarrow -\Sigma^2 i) \Leftrightarrow \prod(\Sigma e \Leftrightarrow -\Sigma^2 I)$$

Thus we differentiate the body where E is dominant on i and the brain, where I is dominant on e.

- st=n; $X^{st=n}$: The fractal, transcendental arrow. Where n determines the complexity of the ecosystem across multiple fractal planes of exi=stence: If we consider that each of those super-organisms integrates a series of simpler planes of existence of lesser information, we can use a natural number st=n, to define each scale of reality. Where st=n will represent the number of planes of existence from the simplest organism, a particle or quanta, to the most complex the Universe. And $X^n$ the number of minimal cellular quanta of the system. Again this is easy to see if we consider the most common transcendental number, 10, where a tetrarkys of 10 elements give birth to a central point (9+1), which transcends as unit of the next scale. And so a Mongol army had 10 soldiers one of which was a sergeant and 10 sergeants were ruled by a captain and 10 captains by a general, so in 3 scales a general was commanding an army of $10^{n=3}$=1000 units.

In that regard the Existential function of the Universe follows also that decametric scale, where n=10, and the total reality, if those decametric scales between atoms and galaxies repeat themselves will have n=∞

Further on, if we integrate together all vital spaces on one side into an absolute space, S and all informative scales in time as an absolute Time, we can simplify the previous equation of st=∞ as a single ST world. So we write:

$$(\sum(\Sigma E \Leftrightarrow -\Sigma^2 i) \Leftrightarrow \prod(\Sigma e \Leftrightarrow -\Sigma^2 I))^{\infty} = S \Leftrightarrow T$$

Where, the physical, spatial arrows are: e, the arrow of energy; i the arrow of information and x, the arrow of actions and motions.

The organic, temporal arrows are: Σ, the arrow of energetic waves; $\Sigma^2$, the arrow of social networks and ⇔, the arrow of organisms and reproductions.

And the fractal, transcendental arrows are:

$e^g$, the generational sum of all the cycles of life (e< or youth, = or maturity and >I or old age) of a species.

$X^{st=n}$, the product of all its planes of fractal existence.

Yet if we integrate all those life cycles across all its planes of space, we define an ecosystem of which the biggest one is the universe.

And so ∑, ∏, are the symbols of an ecosystem and the organisms of its world, which for n=∞ represents the Universe.

So the single Space continuum of classic science, S, is the sum of all the vital spaces of all its species and ecosystems.

Yet if we consider the evolution of those species across time, we observe that simpler forms evolve into more complex forms, from the initial particles to the complex structures of reality, with the passing of time. So T becomes the sum of all cycles of all systems, chained through organic synchronicities, to give us the absolute time of classic science.

Thus, we can perceive reality as a simplex space-time continuum, a whole, as classic science does, or in more detail as a dual system of energy and information, a 4-Dimensional reality that reproduces and evolves socially those bytes and

bites, or a series of organic parts and herds, which gather into ecosystems that evolve in bigger scales till reaching the size of a Universe. In that sense, other simplified, valid expressions of the function of existence used in this book will be S⇔T, SxT (dual systems) or ∑Se⇔∏Ti or Exi=st (4-Dimensional ones.)

Needless to say the relativity of perception and measure makes each of us an Island-Universe, which can be described in maximal detail with the 9 arrows, as the scales of the Universe are relatively infinite and so even though normally we shall limit the study of a specific species to n±st=3 planes, we can obtain from most species multiple space-times. So a human could be studied till his atomic detail.

And so we have written departing from its minimal bytes and the final generator equation of all realities. Since with those 3 x 3 arrows of spaces-times we can explain it all, the whole, 'the thoughts of god', the game of existence, and its 'imprinted body', the Universe, or each of its self-similar parts, its details.

Now the meaning of that equation must be clear: it generates all the other equations of the Universe. Consider for example how it implies several operations.

The operator ⇔ has in fact 2 forms: one dynamic as a flow, < = > and one static as a knot: X. The first one fusions the 3 ages of growth, balance and diminution <, =, >. It means that generation has 3 ages, < = >, and two operations, =, parallelism, when the exchange or transformation is balanced or X, perpendicularity, when the top predator element of the exchanges absorbs all the energy from the other system. Thus we can consider instead of a simple equality, a complex transformation with several phases. If we call each side of the equation E and I, then:

$$E=I; \quad E<I; \quad I<E = E>I$$

Each of those phases of the general operator, ⇔, can diminish, increase or divide the 'object'. And so we can divide the operator ⇔ into 4 operators: a mere equality, a sum, a division when the information preys on the energy and divides it or a multiplication when it reproduces it as the energy controls it and uses it with its energy to reproduce. These kinds of events that the equation describes are thus the beginning of a fascinating adventure, to generate reality with the combinations and partial equations derived from the generator equation.

Physicists do it basically when considering SxT systems, which we have explained briefly before, and yet that is not so detailed, so we can consider that we can do either 2 dimensional studies (sxt systems), 4-dimensional analyses (E-Re x I x S) where we decouple space into energy and reproduction, limbs and bodies and information between knots of times and flows of social information, languages and networks. This dual decoupling of space and time create a 4 dimensional Universe and 4 dimensional types of equations, of the type: $(\Sigma e \Leftrightarrow -\Sigma^2 i)^{n=st}$

These 3 combinations of the cycle are 3 forms in which the parameters of them change by transfer between the element of the left (the herds) and the right (the networks).

The fight between herds and networks though is parallel in E=I and that is the definition of an organism. In the other 2 stages or events there is dominant arrow from the relative predator reproductive, energetic body or informative system.

But many laws of science are ceteris paribus analysis of that equation and/or one of its parts. We just have to consider the generator equation, a group structure with a neutral element, 1. Then we can study only a certain part of it. For example, making n=1, the transcendental arrows disappear; if I or E = 1, we are studying only the energetic or informative part of the system; and so on.

It must be in any case understood once and from all that the equation generate events primarily and those events seen as fixed forms become spatial organisms, but the equation is an equation of time rhythms, given by the st-frequencies of the

systems. Let us consider what are the parameters of the equation's main parts:

- The parameters of E are spatial parameters.

- The parameters of I are temporal parameters.

- This fundamental duality, is thus the 3rd key element to the transformation of a topological algebra as this equation is (where I is a topological space, e is a metric space of energy and ⇔ is the cyclical exchange space or toroid) into metric spaces. We know that part of that equation is an energy parameter and the other an informative one.

Thus the generator feedback equation allows to connect the metric and relational study of the Universe of multiple spaces and times by ordering all the time cycles= arrows=dimensions, we observe in the Universe, all the repetitive clocks in which a certain 'non-Euclidean point 'or Universal entity comes once and again to the same topological space in search of its arrow, as its partial equations and more complex systems as a series of connected equations that represent networks, organic or complementary systems, within a given ecosystem.

*Recap*. The Universe and all its relative worlds structure in 3 stairs of parts that become wholes. Each one defines a set of 3 arrows of time. Thus, there are 3x3 arrows of space-time: spatial actions of energy and information, exi, organic arrows that create body herds and informative networks, which become organisms, e⇔ I and fractal, transcendental arrows that define systems of multiple spacetimes.

**35. Actions and waves. Physical systems display 4 arrows.**

We consider several levels of analysis of reality, the abstract, metric analysis of simple systems of energy *or* information; the dualist analysis of complementary systems of reproductive energy and information, which combine in motions called actions; and the organic analysis of ternary systems, which add a new, self-reproductive arrow and allow the social evolution of systems in transcendental, new super-organisms.

Most physical, spatial systems are perfectly described with the simpler level of energy and information, complementary systems and its actions -though it is left for further analysis the question of the existence of ternary structures in all physical systems (given the fact that simple particles, electrons and quarks reproduce new particles, when given enough energy).

Since all analyses of reality are meaningful even if they do not consider the complete system and all arrows, we shall deal here with complementary systems that perform, exi, actions. They define the 3 basic arrows of existence: gauging information, feeding on energy and using that energy to move in the direction in which we have gauged information

Thus a system that combines information and energy is always able to create 'motions' called action, exi, which are the fundamental unit of physical systems. The simplest of those systems is light space, which happens to be the 3-dimensional membrane we live in.

Indeed what we call vacuum-space, the external reality, is in fact light-space. That is, the vacuum is filled with light, which has 3 perpendicular dimensions: a direction of motion, energy or length, in which light moves; a dimension of information or 'height', the electric field; and a dimension of reproductive width; the magnetic field. And so we exist in a spacetime of 3 Euclidean dimensions, filled with light, which makes the dimensions of reality the 3 arrows of spacetime of light, to which we add the social dimension of color, given by the number of photons that come together in a single wave. We are 'swimming' in a world of light as a fish swims in a world of water with 3 dimensions occupied by that water.

It is indeed the thesis of this work that what we call 'lateral motion' of a wave of energy is always a reproduction of its form, imprinted in the medium; and so we consider that the dimension of magnetism in light is in fact its reproductive dimension: Light follows the path given by an energetic field of gravitation, whose energy it absorbs, imprinting laterally a

magnetic 'body', over which an electric field carried by the photon is built. And from that simple scheme many properties and equations of light will be deduced and many questions answered (such as the non-existence of 'magnetic monopoles', since magnetism does not form an informative particle – the photon – which is an electronic, 'fractal head' - or the relationships between the gravitational and electromagnetic field, which fees on it).

The example of light and its dimensions illustrates a tenant of multiple space-times theory: *all physical systems are also ternary systems with an energetic, informative and reproductive-motion field, made of social quanta. Since waves don't move (Zenon paradox) but imprint the medium they travel through with its form, its information, reproducing it.*

The number of dimensions and elements we describe in any system in fact depends on the depth of the analysis. Metric space works basically with 2 or 3 dimensions, as it considers time and space continuous and symmetric (an error, regarding the nature of space, which explains many errors of physics), and ad maximal it adds a 3rd dimension of exi space-time actions. Other sciences, especially biology, go further and analyse 4 dimensions. And that will be the main approach of this introductory work even when describing physical phenomena. For example, physicists describe electrons with 4 quantum numbers, which we shall translate as the 4 main arrows of times of electronic waves, where the principal number defines the wave-reproduction of the electron, the secondary number its energy feeding, the spin number its informative orientations and the social number is the magnetic number that defines how an external field of magnetism organizes a group of electrons, positioning them.

There are however many systems that are not complete, often made with an informative, gauging element and an energetic limb, in all systems and disciplines of reality. Or more often there are systems, which become subsystems of a more complex form and perform only a function on this higher reality. For example, a planar field of energy or force might have as light does 3 arrows but it is for a complex atom the field of energy in which the electron reproduces its nebulae; a weapon is a 'lineal system of metal-energy', but it comes attached to a human being that 'gauges' information, locating the enemy to which it will release the 'energetic action' of the weapon; a virus lacks the reproductive systems, but it attaches its informative code to a cell that will reproduce the system. And so we find that some simpler systems need an external, informative or reproductive 'enzymen' or 'enzymes' to make possible actions with weapons or reproductions of viruses.

And these two essential laws of interrelated multiple times-spaces – the existence of 3 subsystems in all systems or 'ternary principle' that allow us to analyse any system in its 3 internal components and the assembly of subsystems as different as a human being and a metal-weapon to enhance the energetic or informative capacity of the whole through symbiotic actions, are key elements to explain how simple systems evolve into complex, organic ones.

*Recap*. If we consider motion, the reproduction of the form of a wave, even the simplest light-space displays 4 arrows, energy, information, physical actions or speed, exi that reproduces the wave and social evolution of color. Electrons also can be described with 4 magnetic numbers, the main reproductive number the secondary, energetic number, the spin number of informative orientation and the magnetic, social number.

### 36. Internal, topologic vs. external, Euclidean dimensions.

Another important concept to clarify errors of the metric paradigm is the meaning of 'internal' an 'external dimensions', where the internal dimensions are the 3 topological functions of a system – its informative, energetic and reproductive topologies - and the external dimensions those of the membrane, medium or ecosystem it inhabits. Thus in all systems we consider 2 types of dimensions:

*-Arrows/Dimensions of external spacetime* (the form described with external, objective parameters):

Length-energy-motion. + Height-information + Width: bilateral reproduction.

Those 3 simple Euclidean dimensions suffice for most external analyses of reality.

-Yet the internal structure of any i=-point requires *3 topologies of 4-Dimensional reality* and its complex shapes called:

-'Planar sphere' or 'Peano line'=membrane, limbs of energy

-'Cyclical toroid'=Reproductive Body of energy x information

-'Hyperbolic, warped center'=Informative, multi-cyclical head.

This duality considers the Euclidean dimensions an external description of the being, as it moves through the 3 dimensions of the light-space membrane; and the topological dimensions an internal description of the point in its parts and functions. Consider for example the case of a human being:

-Externally all what we see of a human from far away is a point whose energy *moves him in the direction of length*, but he also has *an informative head on top*, in the dimension of height, and he *has reproduced=repeated his organs bilaterally in the dimension of width*.

- But if we were to switch to an internal description we would find a more complex structure, with:

- A warped brain inside that high head, and an eye, which makes with an enormous number of pixels of information an image of the Universe.

- We find a body, below that head, full of cyclical, reproductive organs that combine energy and form to re=produce the substances of our body.

-And then we find our energetic members (a mixture of fractal, broken lines of energy - our limbs that move us in the length dimension – but put together shape a plane) and the external membrane of our being, which is what topologists called a Riemannian, planar sphere.

And as different as all species of the Universe might seem to us, we will be able to describe them all with those simple topological dimensions, which give us the 3 'arrows/cycles/ topological' dimensions of all vital spacetimes.

The sum of all those internal, topological spaces, moving inside an Euclidean, 3 dimensional space in which they trace cycles in search of energy and information to reproduce themselves is what the 3rd paradigm of metric space puts together into a single space continuum and a single arrow of time; what physicists call absolute space and absolute time. And while the error of a single space continuum it's a mild error, by reducing time arrows to a single lineal arrow in the direction of motion-energy, scientists, specially physicists, spatialize, simplify and reduce time to 'entropy', or 'energy', what the clock measures. *And that is a huge error*, as we shall see when we correct and resolve the main questions of physics.

We shall call the 3 dimensions of energy limbs that create length motions; of reproductive, wide bodies caused by toroidal cycles and of high, informative systems with hyperbolic brains, the 3 external/internal dimensional arrows of reality. Therefore the 3 external dimensions=trajectories =arrows of existence, length=feeding on energy, height= perceiving information and width=reproducing bilaterally, are motivated by the internal needs of the 3 inner regions of a vital being, its topological 'dimensions/arrows of spacetime'.

Spacetime and Timespace are also dual definitions that explain those external and internal dimensions dominant in 'energy' and 'form', because none of the arrows/dimensions of reality is pure: all yin has a yang and all yang has a yin. And so

even the simplest 'species' of the light-membrane, light itself, has an organic structure, as we have just explained.

*Recap*. All beings externally move in a lineal dimension of energetic length; perceive from an advantage point of height and reproduce its systems bilaterally in the dimension of width. Internally all of them occupy a vital space with the 3 topologies of hyperbolic information, cyclical, toroidal reproduction and are enclosed by an energetic spherical-planar membrane.

**37. Social, reproductive, organic Arrows.**

Till now we have dealt with the simplex reality you perceive in an obvious manner: the 3 dimensions of spacetime which correspond to the functions of energy-length, width-reproduction and height-information and are common to all topological beings that float in light-space, made also of those 3 dimensions, albeit with a slightly different orientation (speed-length moves the wave of light and so we consider it its dimension of energy, the high electric field gives its form and has the informative photon on top and the wide, magnetic membrane reproduces it). And all this could be written as a simple generator equation, exi=k or e⇔I, where the 3 terms represent energy (e), information (i) and its reproductive cycles (x for simpler, reproductive actions and motions, and ⇔ for complex feedback, dynamic exchanges of energy & form).

A more complex description of all this is given by the 3 canonical topologies of the Universe: the hyperbolic, informative, reproductive, toroidal and planar, spherical, energetic membrane of which all beings are made.

It would seem that all this suffices to explain most of reality and certainly it is a great jump respect to the mere process of measuring the when and how of metric spaces in a single space-time continuum, where the 3 dimensions of space are abstract, and time is just 'what a clock measures'.

But there are other phenomena in reality, mainly of social nature, which those 3 arrows do not fully explain.

*Indeed*, because reproduced forms are self-similar forms, reproduced closer to the parental point, (as in a fractal image, where self-similar Mandelbrot sets are pegged to the parental form), when many forms become reproduced in a tight space they come together into networks and make a bigger system, a herd, or superorganism.

And that game defines the arrow of social evolution: self-similar atoms reproduced in a big-bang associated to form bigger entities, planets and stars. Self-similar cells with the same DNA organize in a palingenetic process to recreate a bigger organism. Self-similar ideas or memes created by a prophet reproduce in the minds of believers, creating a religion or civilization. So social evolution, the $4^{th}$ main arrow of space-time must be always considered to describe all systems - even if it is not an Euclidean dimension, because in light, social evolution appears as color - since all what exists feeds on energy, gauges information, reproduces energy and information and evolves socially.

But how things evolve socially? It is not enough just to enunciate this social arrow. When we study social evolution in more detail, in fact we find the existence of 3 social arrows:

- $\sum$: many simplex units of energy that we shall call bites, come together into herds, which we represent with the symbol of a summation, $\sum$.

- $\sum^2$: Many simplex bytes of information come together into networks, which we define with the square of a summation, as networks are defined by having a square number of 'axons' that communicate its informative points.

- ⇔, Re, E⇔: When those 2 systems come together they create a complementary, cellular organism, body or field, which defines cyclical trajectories between the limbs and heads, the particles and energetic membrane.

Thus the body absorbs bites of energy and reproduces cells of the organism; and we represent it with the ⇔ feedback symbol,

the arrow of Reproduction, Re, or as it often comes attached with 'mouths' that absorb energy or 'limbs' that convert energy into motions, with the E⇔ symbol.

Thus all together form a complex, dual, cellular superorganism of space-time, $\sum$ E⇔$\sum^2$i=St or exi=st-ential organism.

And so we define 3 social, organic arrows:

-$\sum$: the arrow of social evolution of energy bites into herds.

- $\sum^2$: the arrow of organic evolution of bytes of information into networks tied together into a bigger whole - a head/particle that absorbs bytes of information, also called 'pixels' and stores a memorial, perceptive image/mapping of reality. This network acts a single being, sustaining in each 'fractal' cell, the same informative, memorial mapping of reality that allows it to act as a single one, *either internally* (same DNA in the cells of an organism, same book of Revelation in the mind of believers that create a God or subconscious collective, same particles in a bosonic state) or externally (cells that store multiple pixels, coordinated by the network into a single image). This is the most complex, fascinating arrow of existence, or transcendental arrow, because it is the arrow that allows reality to become organic, as it makes from simplex parts a whole that emerges as a unit of a bigger space-time plane of existence. Further on, the arrow that puts together parts into wholes dominates as a whole the herd of cells of the body.

And so we define, a superorganism made of reproductive bodies/waves, limbs or fields of energy and social networks of information, which extends through 3 different spacetimes:

- An external ecosystem of energy (st-1 plane of reality) in…

- Which the limbs move by absorbing external energy and the head or particle gauges information by absorbing that external energy as information; and the body reproduces new cells absorbing both energy and information (st-plane).

- Which transcends as a whole (st+1), thanks to the network of information that controls the entire Organism, becoming a fractal space-time world in itself: $\sum E \Leftrightarrow \sum^2 i=St$

*Recap*. The social evolution of herds into body particles gives birth to the arrow of wave evolution; the association of informative cells gives birth to the arrow of network evolution, and both together create ternary, organic systems, which use internal limbs or external fields to feed on energy. Thus a more complex analysis finds that all systems are ternary systems with lineal limbs of energy, reproductive bodies and informative heads, sandwiched between two ±st planes, the smaller st-1 micro-points of energy and information (pixels) and the bigger ecosystem, which only the network of information can observe as a whole that transcends cellular existence (st+1).

### 38. Fractal, Transcendental arrows.

We call fractal, transcendental arrows to those arrows that go beyond the organism both in time (generational arrow of existence of the being between its creation and extinction) and in space (ecosystemic arrow), *finally evolving together in time and space into a super-organism.*

*Thus simple 'active' complementary systems become complex, organic systems, which finally transcend into super-organisms, till reaching in the transcendental scale the biggest super-organism of them all the Universe.*

Indeed, the generation of a being in a life/death cycle will cause a spatial 'radiation', as the being multiplies once and again, and so it will create a series of generations in space-time till the *species* becomes extinct. *And so the species can be considered a super-organism with each individual a cells of the system*. And we shall see that indeed, the entire life-span of a species follows also the 3 ages of life and its diversification into ternary species of energy, information and reproduction, and its final evolution into a super-organism or its extinction by a stronger species with more exi=stential action/momentum.

And since there is nothing else that we can say of a being before its creation and after its extinction, the 3 transcendental

arrows of generational cycles, reproductive radiations in an ecosystem, and transcendence into a higher super-organism finishes all what we can know of any reality, all what is science, all what exists, all the whys of the 4th paradigm.

-St: And so the 9 arrows together give us the complex generator equation of all events and forms of a certain world, universe, ecosystem, reality or superorganism – its total, absolute spacetime description, EXI.

It is the unification equation, described earlier in greater detail that physicists tried to extract from reality but failed because they tried to do it with metric spaces instead of topological spaces and with a single arrow of time energy or entropy instead of the 3x 3 arrows of reality. We shall often quote that equation in its simplified 4 dimensional structure: E x i=st; and call it the existential function.

You too are generated by that equation.

From that general equation we can descend to the when of its metric details, since each species absorbs different types of energy and information that define the form and speed of its reproductive and social cycles of time. So from a higher point of view we can then connect according to the correspondence principle each science and species with its specific space-time cycles/arrows – the details of the thoughts of god.

According to the dominance of those triads of arrows we also classify science in physical, biologic and sociological sciences:

- Most physical entities perform only two complementary cycles, most of its existence. So all particles move but few gauge information beyond a mechanical, geometrical series of action-reaction paths; and this explains why physicists have been concerned only with the arrow of energy and motion and metric spaces to measure the trajectories of all those moving particles. Yet in certain cases those particles decouple, reproduce other particles and form more complex atomic systems, and this moves us to the next science on the ladder of complexity, chemistry, which is more concerned with the repetition=reproduction of molecules and its social evolution.

- And as we move further into biological sciences, through the ladder of bio-chemistry, biology and sociology we realize that the arrow of energy becomes secondary and the arrows of information=perception, reproduction and eusocial love that bonds minds into social structures dominates.

- In this we are different from physical structures, which are always dominant in energy and motion and create social networks of extreme simplicity with very few elements and variations - so galaxies which are huge aggregations of stars will turn out to be self-similar to electronic nebulae. And in fact we shall find a fractal equation of unification of quantum electromagnetic forces and macrocosmic gravitational forces based in that self-similarity of structure of the infinitely small and big(A,II).

So it seems the Universe has 3 different games of existence: - The physical game of self-repetition of spatial energetic structures that evolves into the bio-chemical game of evolution of reproductive, organic structures; which evolves in complex super-organisms and ecosystems.

We are the summit of that second game of existence that evolves the arrows/languages of information, creating social superorganisms, cultures and civilizations. And galaxies are the summit of the expansive game of spatial structures that develops to its limit the arrow of energetic, simple spatial topologies – reason why there is almost as much data about the Universe that about biological structures and even more data about sociological cultures…

*Recap*. The sum of all the generational life-death cycles of an organism, which will be repeated a finite number of times between birth and extinction, and its spatial radiations in an ecosystem, creates the transcendental arrow of super-organisms, which evolves from particles to galaxies reality till creating the absolute space-time field, st, of the Universe.

**39.The Universe is a tapestry of those existential arrows.**

Let us resume what we have learned:

The Universe is made of self-similar complementary species of spatial energy and temporal information. We are not in space-time but are made of vital spaces with a duration in time. Our spaces are all made of topological forms of 3 types, which are the canonical types of all the morphologies of a 4-dimensional universe: informative, cyclical, hyperbolic spaces such as the brain, the black hole or the DNA center of cells; reproductive, toroidal cycles, such as those of stars in the galaxy, organs in the body or RNA systems in the cells and a planar sphere, or membrane of energy that isolates the system, allowing selective exchanges of energy and information with the external world, such as the halo of galaxies, the crust of the earth, the protein membrane of the cell, the skin with its sensorial apertures in a living being or the limbs that move us.

All those systems and forms have specific functions, which are also self-similar in all systems and can be reduced to 4 main time arrows or basic cyclical events of existence: energy feeding for the body to be able to reproduce; and information for the mind to be able to communicate and evolve socially with self-similar beings.

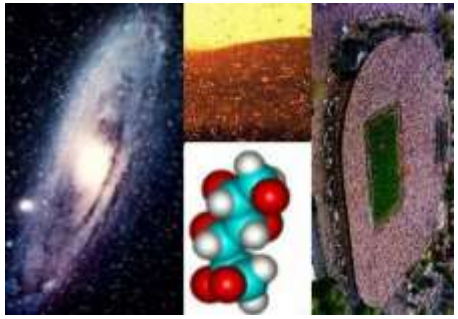
And all this can be explained with a single equation, the equation of existence: $\sum Ex\prod i=st$.

A more detailed analysis further divides the social arrow in 3 x 3 organic and transcendental arrows, completing an exhaustive 9-dimensional analysis of reality.

All this said it is obvious that the most important arrow is the arrow of informative networks that we shall study in detail.

*Recap*. All systems, perceive information feed on energy reproduce and evolve socially in bigger systems, because if they do not reproduce their limited time will extinguish the species and if they evolve socially as bigger multicellular organisms they can win in the struggle of existence against simper, smaller beings.

## VII. SOCIAL NETWORKS: SUPER-ORGANISMS.



*All species are social herds that follow the same energetic, informative and reproductive cycles that shape their 3±st existential ages, in scales of reality. In all the graph: social stars and swarms of locust, absorbing energy - interstellar gas and grain. Bottom right, social herds bound by informative flows: a group of atoms joined by electromagnetic forces and a human group, absorbing visual information.*

**40. Networks.**

The Universe constructs super-organisms, through a causal process, departing from simple, amorphous flat surfaces of energies – herds of Non-Euclidean points with lineal motion.

It is a simple ternary causal event, which is different from the causality of what we call the cycle of life, E->X->I, yet still an essential chain that we shall see constantly in the Universe.

So the next question is how the universe constructs reality, departing from its generator equation. And the answer is: constructing superorganisms, in a causal order, e->i->X->S.

A form fractalizes, becomes in-formed, and loses energy= speed=motion. For example, a line becomes a Koch fractal or breaks into a Cantor dust of self-similar cells; a line becomes a pi-cycle. In this, simplest and most repeated E->I, we can write 1->3>Pi: a line has reproduces from past to future 3 self-similar motions, then it coils into a pi-cycle.

The next stage would be then the reproduction of that cycle in a lateral, new dimension of height. In this manner, we have obtained 3 fractal iterations: the line has become a cycle (or a

Koch curve or any other fractal topology with more form and dimensions), which has become a tube.

E->I->X (symbol of Reproduction and sex, born of the product and combination of exi).

If duality covers simple events, mostly E<->I combinations, when we construct an organism we are playing at least with a causal 4-sequential arrow of time, Energy becomes fractal information, which reproduces laterally and so the light of length-speed becomes a time cycle with rotational speed w, whose frequency curries more information, and such form moves like a Maxwell scree reproducing in the 3 dimension of width. E->I->X. And yet, this rather mechanical sequence of creation of a fractal 3 dimensional Universe becomes far richer in forma and meaning when we add the 4th Eusocial love, of Social time the longest arrow that finally creates a form of stable space-time that exists, a superorganism: E->I->X->EXI. Since as time goes by, entities evolve into more complex organisms by the power of love – by sharing energy and information in social networks. The 4th arrow of time evolves socially parts into wholes, waves, herds and organisms:

Particles gather into atoms that evolve into molecules that associate into cells that gather into organisms that create social networks - planetary ecosystems, which are part of solar systems, herded into galaxies that form Universes. Those processes of social evolution occur thanks to the creation of social networks among self-similar (hence reproduced) beings, in search of the same type of energy (hunting herds) or information (organisms joined by nervous/informative and blood/energetic networks). Thus, the arrow of organic evolution derives from the arrow of information that allows entities to come closer and 'act in parallel' under the command of an informative language, which we formalize with the social symbol, Σ. And its reason of existence is to elongate the survival of the organic system: Any cyclical vortex of time accelerates inwards, losing energy/surface as it increases its informative speed. When we generalize that concept to all Time-space systems, it turns out that the arrow of information dominates the universe, wrinkling and warping any cyclical system, which will exhaust its energy, converted into form. Thus, our time clocks and vital spaces increase constantly their information, diminishing its energy space, towards a 3rd age of excessive warping and limited energy that will not last forever. Since the cycles of exchange of energy and information, the geometric beats of reality between expansive and implosive, entropy and informative states, are limited in their repetitions by accidental errors of all kind, which establish the need for reproductive and social arrows in order to ensure the survival or immortality of those 'patterns of form' – entities made of lineal fields and bodies of energy; cyclical particles and heads of information, who must be reproduced to ensure a longer existence. This means that only those species able to increase their existence in time by reproducing its form and in space by evolving socially into bigger entities survive.

*Recap:* The 4 main arrows of time cannot be reduced without losing detail, but they can be philosophically and 'bio-logically' grouped as 'organic systems'. Those organic systems that synchronize accumulate and organize clock-like arrows of cyclical time, are in fact all self-similar, as all can be described with the 4 elements, ∑E⇔I of organisms: cells, networks of energy and information and reproductive systems.

### 41. Super-organisms: knots of cyclical Time Arrows.

'We are all made of spatial energy, flows that seem to occupy space but are 'vital space' and have a 'causal why'. For that reason, all species participate of the geometric and causal properties of the arrows of energy and information and follow the same patterns of self-organization to create a higher 'space-time plane' of reality. So, for example, all informative systems will be on top, in the dimension of height; they will be smaller than the complementary energy system and they will have cyclical form, regardless of the species we describe. So DNA

nuclei are round and smaller than the cell's body, heads and antennas are on top and are cyclical and smaller than the body or tower that holds them, cameras are small and spherical, etc. Since, once we understand the fractal, scalar structure of the Universe, the old distinction between organic and inorganic form loses its meaning, beyond its anthropomorphic role of making man the only intelligent, vital species of the Universe.

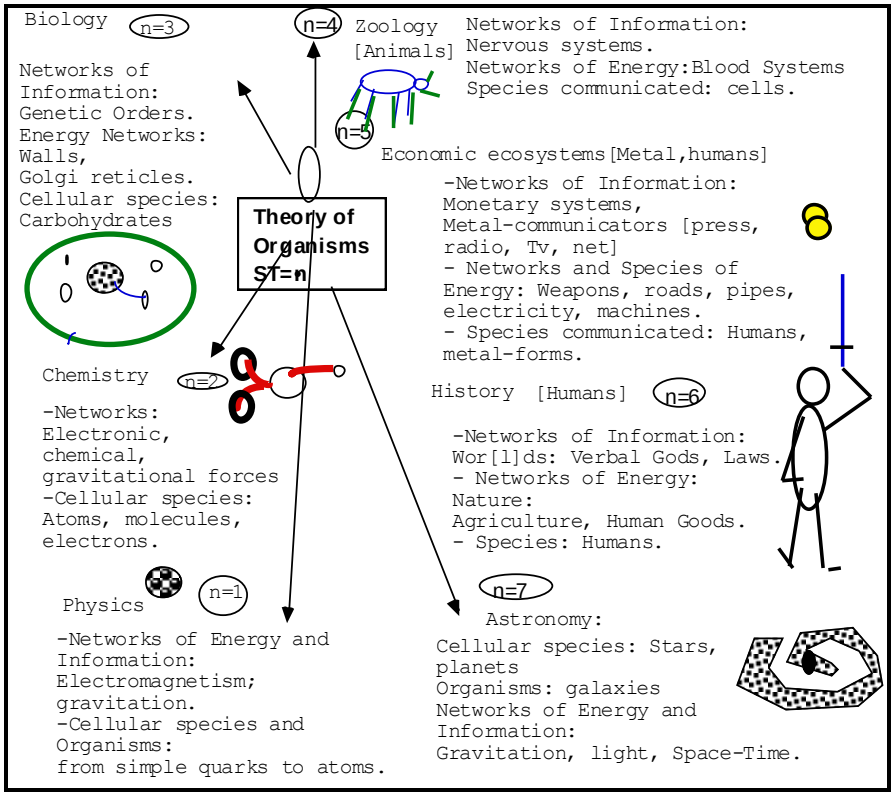
The complex logic and Non-Euclidean geometry of those knots of Time Arrows set the formal basis to understand the structure of the Universe and all its self-similar parts. Since:

*'The Universe and all its parts are fractal entities of energy and information.'*

Though the specific combinations of energy or information of each species - defined by its 'vital' or physical, Universal Constants (energy/information ratios) – might vary, the space-time structures and cycles of all those social organisms will be self-similar: All entities are 'cellular societies' organized through energy and information networks that bring about processes of social evolution. In all species studied by science a common phenomenon occurs: the existence of parallel groups of beings organized into a single social form. Molecules are made up of atoms and electronic networks; economies are made up of human workers and consumers that reproduce and test machines, guided by financial networks of information (salaries, prices, costs); galaxies are composed of stars, which orbit rhythmically around a central knot, or black hole of gravitational information. Human bodies are organized by cells controlled by the nervous, informative system. A tree is a group of leaves, branches and roots connected by a network of energy (salvia) and information (chemical particles). Cultures are made of humans related by verbal, informative laws and economic networks that provide their energy.

Sciences study those organic systems, tied up by networks of energy and information. In the graph, we see the main st-planes studied by human sciences and their 4 main time arrows, Σ *E ⇔I*, which in static space give birth to the 'organic elements' of all species: social cell of energy and information and the reproductive networks that relate them. Thus, there are 4 basic elements in all organic systems:

1. Cellular units.
2. Networks of energy or vital space.
3. Networks of fractal information.
4. Networks that reproduce energy and information.




*All Sciences share the laws of duality and organicism. Since the forms of energy and information and its properties remain invariant in all the scales of reality. The result is the fractal structure of the Universe, described in the next graph: Each science studies a 'scale of organic size', its cellular species of*

*energy and information and its arrows of time and events, which culminate in the self-organization of those parts into social wholes. Yet the proportion of energy and information of the species each science studies varies, since the Universe displays a hierarchical arrow of growing informative time, from the simplest forms of mathematical space (with minimal informative content), to the complex information of its most evolved organisms (with minimal geometrical regularity).*

All entities are generated by reproductions and transformations of energy and informative cycles ($\Sigma S \Leftrightarrow Ti$), organized in cellular units, through networks, and ±st Planes of self-similar forms. Yet, since those cellular units $st_{-1}$ are made of smaller $st_{-2}$ cells, which show the same structure, we can define any organic system as a super-organism (made of smaller, self-similar super-organisms):

*'A super-organism is a group of cellular super-organisms joined by energetic, informative and reproductive networks.'*

Thus we unify the properties of Universal Systems and the sciences that study them under a single template definition, according to which simple systems and complex organisms will differ only in the degree of 'completeness' of its networks and the specific energy or information they are made of:

'A super-organism is a network composed of a population of (name a particular cell or cycle), related by an energetic, reproductive or informative arrows.

A fractal organism (name an organism) is a population of iterative (name a cellular species), related by informative (name a language or informative force) and energy networks (name a kind of energy), which combine into a reproductive network that iterates the organism.

A universal ecosystem (name a specific ecosystem) is a population of several (name the species), related by informative languages (name their languages or informative forces) and energy networks (name the energies).'

Fill the gaps with a specific species, language/force and energy and you can define any network-organism in the Universe. While if the system is composed of several species that occupy the same space but have different networks of energy and languages of information, we talk of an ecosystem:

- An atomic organism is a population of (electronic) energy and (nucleonic) information, related by networks of (gravitational) information and (light) energy.
- A molecular organism is a population of atoms, related by networks of gravitational energy and networks of electromagnetic information (orbitals, London, Waals forces).
- A cellular organism is a population of molecules, related by energetic networks (cytoplasm, membranes, Golgi reticules) and genetic information (DNA-RNA.)
- A human organism is a population of DNA cells, related by networks of genetic, hormonal and nervous information and energy networks (digestive and blood systems).
- An animal ecosystem is a population of different carbon-life species, related by networks of light information and life energy (plants, prey).
- A historic organism or civilization is a population of humans, related by networks of verbal information and networks of carbon-life energy.
- An economic ecosystem is a population of human workers/consumers and machines, related by networks of digital information (money, audiovisual information, science) and energetic networks (roads, electric networks, etc.).

An economic ecosystem differs from a historic organism because they use different languages of information (civilizations use verbal or ethic laws while economic ecosystems use digital prices) and include 2 different species: human beings and machines.

- A galaxy is a population of light stars and gravitational black holes, related by networks of gravitational information and electromagnetic energy.

-A Universe is a population of galaxies joined by networks of dark matter and energy.

We establish thereafter a parameter of multiple space-time complexity, st=n, to classify all those relative scales of spatial energy and temporal information of the Universe, starting by the simplest scales, st=0 (mathematical cycles and lines), st=1 (Gravitational space), st=2 (electromagnetic space), st=3 (atomic particles) and so on, till reaching the most complex, macro-structures of the Universe (st=9, galaxies).

This parameter becomes essential to formalize a type of scientific laws widely ignored by science, *which* define the interactions between several scales of reality. In physics:

- Between the small quantum scale of electroweak forces and the bigger gravitational space-time.

- In biology between the cellular microcosms, the individual organism and the ecosystems or societies in which those organisms exist, as individual 'cells' of a bigger whole – the species. Since those relationships are essential to explain all kind of natural and social phenomena, from the life/death cycle (in which cells reproduce, organize socially in networks, emerge as individuals of herds and societies, and die, dissolving again their complex 'st' networks into st-1 cells), to the meaning of religions, in which humans act as mental cells of a subconscious collective we call God.

At present though, each science studies only one scale of form and its specific laws and events, as if they were unrelated to the laws of all other scales and species. Only System Sciences, the philosophy of science considered in this work, studies together the mathematical, morphological and biological laws that define the 4 main arrows of time and apply those laws to all the species of each of those scales, since the Laws of Multiple Spaces-Times are common to all of them, regardless of the 'specific' qualities of each species:

- All species in the Universe absorb energy, gauge information (even particles, reason why their theories are called gauge theories), reproduce (quarks absorb energy and reproduce jets of 'quarkitos'; so do electrons that absorb energy and break into a shower of new electrons, and since those are the two basic particles of reality, it follows that all systems can be reproduced), and finally, all entities of the Universe evolve socially, gathering together into bigger super-organisms, from particles that become atoms that become molecules that become cells that become living organisms that become societies, nations and religions, super-organisms of History.

Thus Super-organisms are made of:

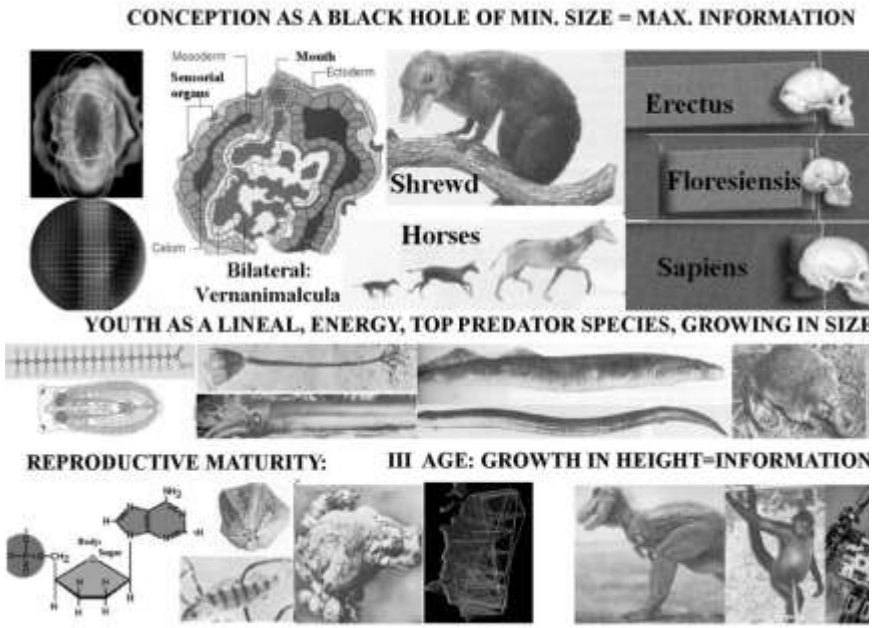
- Relative energy and information units ($\Sigma Se$, $\Sigma^2$ Ti), whose cycles/cells of transformation are described by feed-back equations of the type $\Sigma E_{st-1} \Leftrightarrow \Sigma^2 I_{st}$

- 3 dimensions/physiological networks of energy, information and reproduction ($\Sigma E_{st-1,} \Leftrightarrow, I_{st}$).

- Their ±st social Planes that ad $\Sigma\Sigma ExI_{st-1}$ cells into $\Sigma ExIst$-wholes, parts of a bigger $ExI_{st+1}$ whole.

*Recap:* The 2 primary arrows of time, energy and information are geometrical, and its properties can be studied with the laws of mathematical physics; while the 2 complex arrows of time, reproduction and social evolution are biological, explained as 'strategies of survival' that ensure the immortality of the logic systems of the Universe. The shapes of energy and information are 'invariant at scale', meaning that cycles of information on one side and forces of lineal energy on the other side, reproduce their shapes and gather together into bigger, cellular, social networks, creating dual entities, made of 'fields/bodies of energy' (physical/biological jargon) and 'particles/heads of information', (Principle of Complementarity). All systems of the Universe are complementary, formed with a region dominant in energy arrows (body or force) and a region dominant in information cycles (particle, head). Those dual, social, whole entities have more energy and last longer in time than individual parts. Thus, species with a limited vital space and time duration ensure their immortality by expanding its size in space and its duration in time, as parts of bigger energy/information systems.

## VIII. TOPOLOGICAL EVOLUTION.




*Evolution follows the arrow of growing information, increasing both, the dimension of height and the social organization of individuals into herds and complex organisms, through a common language of information.*

### 42. The Evolution of Information.

In the graph, the understanding of the arrows time, its dimensions, causal order, and the way in which they evolve individuals into social organisms, can also resolve and advance the science of Biology and evolution. Since living beings are also knots of time cycles of energy feeding, information gauging, reproduction and social evolution, perceived as still organisms, whose purpose is to evolve individual 'cells' of the same species into more complex beings. Thus chemical life cycles chain each other into complex systems called cells that evolved into bigger scales, till creating the biological cycles /clocks of information of human beings, the most complex informative species of the Universe. Further on, the duality of cycles/particles/heads of information, complementary to energies/lineal motions/forces/bodies also applies to biology, where bodies and heads create living systems.

How life evolves is disputed between evolutionists, who believe in a selective chaos and creationists, who think there is a design. Time Theory shows that neither is wrong or right. There is not a personal God that creates us - an ego trip of religious fundamentalists - but there are limits to the chaotic forms of evolution, set by the fact that the morphologies of energy and information are fixed by the efficiency of energetic lines and informative cycles, by the need of complementary designs, by the existential arrow of social evolution and reproduction that favors survival; and ultimately by the mathematical topologies and dimensions of 'fractal information' and spatial energy, which define the outcome of evolutionary tendencies. Indeed, watch the drawings of different life beings made of informative nuclei/heads and reproductive body. Informative systems are always smaller than bodies. They are always on 'top' of bodies, perceiving more from the advantage point of view of the dimension of height. Further on, since information is bidimensional, informative systems are bidimensional (only a few animals have 3-dimensional vision). A book, a screen, a pulpit, an antenna, emits information from its top. A head, a camera, an electric field is on top of a body of energy.

This dominant arrow of information is *dimensional*; so species increase its height dimension, from planarians to human beings, a tall species of information. It is *topological*, so they evolve cyclical forms or heads on top of lineal forms or bodies. And it is *eusocial*, so they evolve from individual cells into social organisms through a common language of information (insects, human beings). Those dimensional, topological and eusocial laws complete Theory of evolution:

Ultimately, each species made of self-similar individuals is also a cellular super-organism, which follows the same causal

arrows of organisms, with an increase of information towards its '3rd age'. Those 3 ages of 'life' in cellular species become then the 3 'horizons' of evolution of species, which start as energetic, planar top predators (first shark fishes, first worms), with minimal size. Soon the species goes through a young, energetic age of growth in spatial size. Then it follows a II horizon of diversification and massive reproduction of the species (radiation age); and finally the species goes through an informative age of evolution in height and brainpower. Then, either a new, more evolved species appears, causing the death of the previous species, which becomes extinct or dwindles in numbers; or the social evolution of the individuals of the species reaches such a degree of integration, through a common language of information that a macro-organism emerges. So ants successfully create superorganisms called anthills becoming the most successful animal on Earth, whose total life mass is equivalent to the life mass of humans, which also organize themselves into super-organisms of History, our Gods and civilizations. The success of those 2 species shows that the ultimate survival strategy in the Universe is that of social evolution. Since the total mass of 'ants' and 'humans' are the biggest 'living masses' of the planet, as the most complex social superorganisms of Earth.

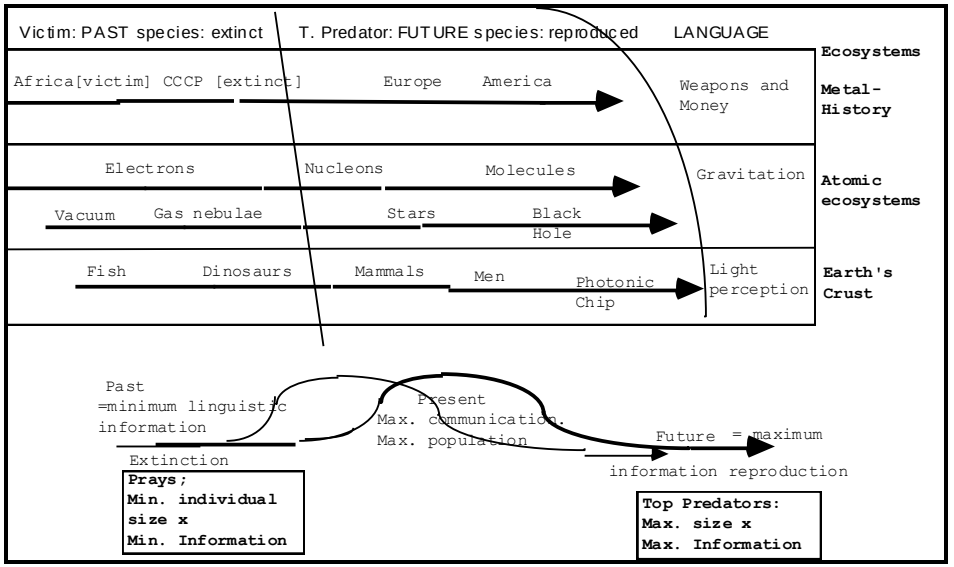
*Recap:* Life species can be considered as superorganisms made of individuals=cells, which evolve through 3 horizons=ages, following all the geometrical and logical laws of space-time systems, as life systems are also complementary systems made of reproductive bodies and cyclical heads of information.

### 43. The fifth dimension of time: generational cycles.

Species become extinct or preys of trophic pyramids, if they don't evolve informatively in social super-organisms, since as species their generational existence is also fractal, finite: all species have a genetic clock, the telomeres, which make them degenerate after a set number of reproductions. It happens to cells that become cancerous or suffer apoptosis after their telomere clock stops; it happens to organisms that degenerate, especially in groups with little genetic diversifications; it happens in light that gets tired after $10^{10}$ years light of wave reproduction; as it is the best explanation of the cycle of light/dark energy; it happens to others particles whose mean life is often confused as in the case of light with its total sum of generational, particle/antiparticle, wave/particle cycles of existence; and it happens to cultures and civilizations, which have a decametric cycle, becoming destroyed every 800 years after 10 human generations. Yet those who evolve socially as 'organic cells' of a bigger organisms, seems to survive the generational cycle, since an organic cells needs less exi force and it is protected from the environment by the bigger superorganism it lives in.

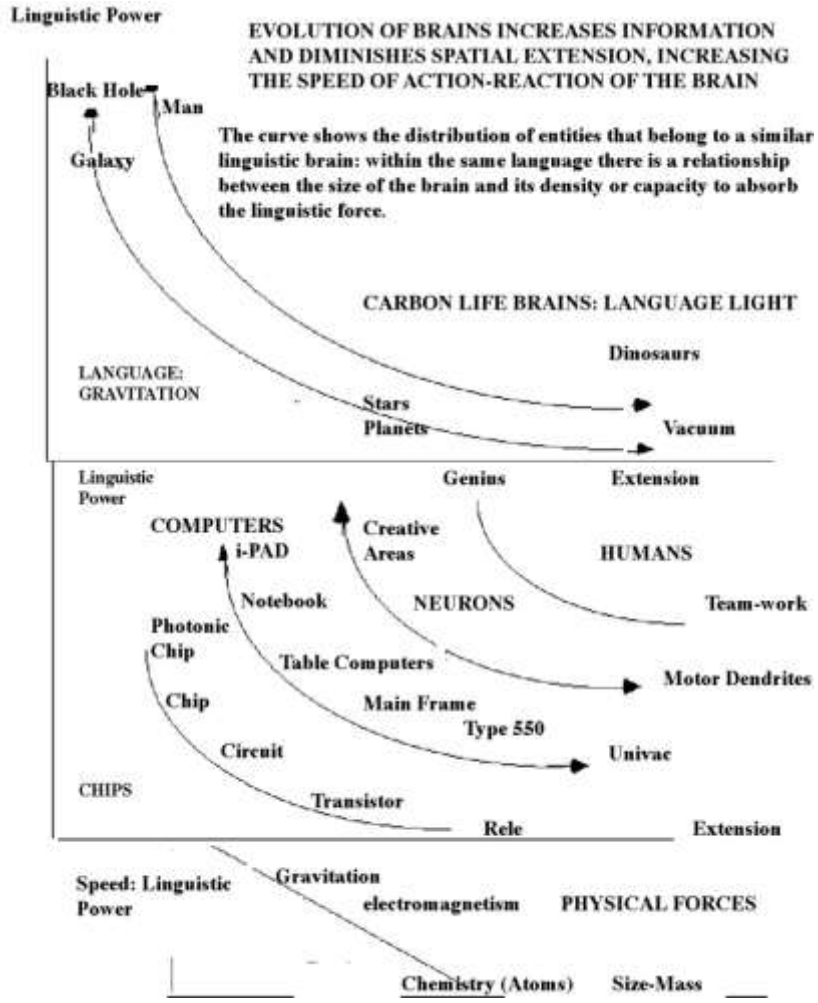
*Recap*. The 5th dimension of time is the generational clock-cycle.

### 44. The existential force. Strategies of survival.




We conclude that evolution is a guided evolution of form: Species evolve towards higher information. And those who don't increase their capacity to understand the language of information of its ecosystem with better brains and better social systems become extinct in its relative universe. In the

graphs we trace existential curves of species that survive better thanks to their informative arrow:




Energy and information motions become the generating, primordial cellular units of all species, including humans. Any system of reality is complementary. It has both -a lineal limb/force of energy and a processor of information or cyclical 'head/particle'- that co-exist and evolve together. So the Law of Complementarity relates both inverse arrows in a static field/organism, creating complementary systems, composed by systems that process energy or 'fields/bodies' (physics/biology) and systems that process information or 'particles/heads' (physics/biology). How can we measure the efficiency of the 2 parts of the system together? Through the existential force.

The existence of multiple knots of Time Arrows implies that in the Universe of multiple time cycles, the words past, present and future, are also relative, quantized to each individual, who lives his past/youth or age of energy, present/maturity or age of reproduction and future/old age of information before dying, dissolving i=ts exi=stence. Thus we need to analyze the relationships between entities which are in a relative past and interact with others that are in a relative future.

The simplest case is a family relationship between a grand-father, a man of the future with the wisdom of knowing in advance the cycles of time that his offspring will live, and its younger, less informed species: the young learns from the elder knowledge of previous cycles that will happen to the 'past being' into his future.

If we draw the example from different species, however the encounter will be Darwinian and only species which share the same information evolve together. Then the old, more evolved species with higher information will dissolve the simpler species into its relative past, as victim: there will be a Darwinian fight and the more evolved time knot from the future will kill and feed on the simpler form. And that is why we can establish that the relative future is guided by the arrow of information and social evolution, which creates better species. Since in a contact between past and future species, the future species survives, due to its better energy and information, its better existential force. It is thus possible to study from a mere temporal, evolutionary perspective the outcome of encounters between different 'knots of time'.

When we consider the 2 'simple' arrows of time that create the future, energy and information, as we do in Duality, all simplifies and explains itself, like it happened in earlier astronomy when Copernicus put the sun in the center. And one

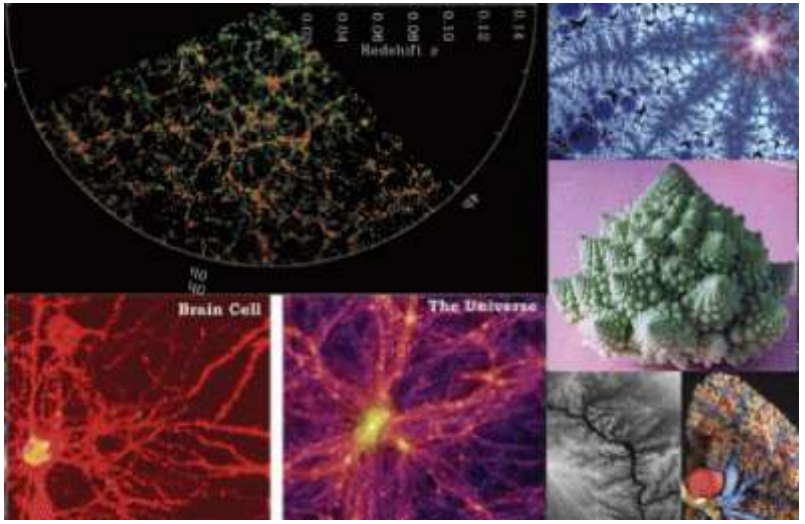
of the things it simplifies is the meaning of survival, which can be resumed in a simple equation: Max E x I = Survival. This function E x I, is the existential force, which explains that a species with the best energy body/force and informative particle/head will survive.

The existential force is equivalent to a particle's momentum, Max MV, which determines the survival form in material collisions. In biology the species with better body and brains survives, which made lions and humans the top predator species of this planet… till we invented weapons and computers, energetic and informative species, made of metal, which now we fusion into robots, potentially the new top predator species of this planet. In the galaxy the highest existential force or momentum is that of a black hole. And it is proved in the Galaxy that the collision of a black hole of any size with any type of star converts the star into a black hole.

An important characteristic of the Existential force is that it favors a relative balance between the energy/body/force and informative/particle/head of the system: the more self-similar are both in quantity of cells and the higher the number of its networks/connections, the more synchronic they act together, and the higher the Existential force of the system is. This fact is the origin of the classic, harmonic, 'beautiful', mature state of most forms of existence that are in balance between both parameters, in a 'mature', steady state age.

*Recap*: The Universe selects the species with maximal energy and information: Max. E x I ->E=I. It will be a biological top predator or a particle with maximal momentum.

## IX. REPRODUCTIVE ARROW: FRACTAL NETWORKS




*In the graph, several experimental proofs of the fractal, organic structure of all beings of reality: On the left, the Sloan fractal map of galaxies and its comparison with a neuronal cell; on the middle, an ice fractal, a plant and a river; on the right, a cluster of galaxies and a lung. Fractal and non-Euclidean mathematics have evolved our understanding of information in topological terms, defining a new Fundamental particle of the logic/geometrical Universe, the Non-Euclidean Point, which unlike classic Euclidean points, has inner parts – an informative center and a field of energy that moves it. Such points constantly communicate energy and information with self-similar points, through non-Euclidean lines (waves which share the energy and form of those points), shaping together 'Non-Euclidean space-time planes', the network-entities of the graphs, which all structures of nature constantly reproduce organizing a canvas of simpler, energetic 'cellular' motions. From the simplest particles, quarks and electrons that absorb energy and reproduce new particles to the most complex informative species, human beings, reality is made of bytes of information and bites of energy, evolved in complex, social networks through fractal scales, from atoms to molecules, to cells to organisms, planets and galaxies. We can mathematize*

*those processes using non-Euclidean topologies and generator fractal equations that iterate and self-organize in networks those points of nature - an ice geometry, a DNA code, a cellular structure, a physical particle. Thus, when we fusion the mathematical and organic understanding of reality, the Universe appears as a fractal of energy and information, made of self-similar parts, which constantly reproduce their forms. And the quest of the fractal paradigm is to find an equation able to define all those systems - the 'Fractal Generator of the Universe': E ⇔Ti*

**45. The why of science: the topological, fractal paradigm.**

'Each point of the Universe is a world in itself 'said Leibniz. What he meant would not be understood till the end of the XX century when we discovered the fractal paradigm, the new paradigm of science which will substitute the Physical paradigm which has dominated our comprehension of the universe since the XVII c. Where indeed, each point of the Universe, when we come closer to it, becomes a super-organism, made of cells with self-similar functions of time, which repeat in all scales with the same logic behavior.

In other words the Universe is a fractal of Time, a fractal of information which is constantly being generated and imprinted in reality. It is a fractal of 4 self-repetitive motions, energy, form, reproduction and social evolution, constantly happening around us in bigger and smaller scales, in bigger and smaller cycles, all type of beings feeding, reproducing, energizing and informing themselves. And because those actions are geometrical, they leave a certain trace which betrays the purpose of the action: a lineal path of feeding, a vibration back and forth of reproduction, a cyclical, implosive, informative process, and so on.

The Universe creates superorganisms by creating first fractal complex informative cells from flows of simpler energy, reproducing them and self-organizing them in 2 parallel, complementary networks, one of energy and one of invisible, faster, thinner information that controls the entire system. We often see only with the scientific method one single of those 2 networks, as gravitation and since most of our human existence magnetism appeared as invisible to us. And it is a general rule that both space-times, the one of energy and information, have different Universal Constants which are ratios, e/I and i/e and exi, which define the arrows of energy, information and vectorial reproduction of any organic dual space/time plane of the Universe. Where the space-network of energy and the informative-network create a holographic organism as those we see all around us in reality.

The best mathematical and logic description of all those qualities that structure reality -self-repetition in smaller and bigger scales, motions with geometrical form, feed-back action-reaction processes, absolute relativity of size - are provided by Non-Euclidean and fractal geometries, the geometry of information, reason why the 2nd part of this book will develop the new formalism of the fractal paradigm, poised to substitute the quantum paradigm and resolve all its questions in physics.

The result of course is that we see fractal structures created by the paths of knots of time, following its arrows of exi=stence in all systems of the Universe. This is what we see, the how of those Time Arrows: fractal paths of existence.

Thus, we shall now finish this first section dedicated to the 'metaphysics' of the fractal paradigm', the why of those paths, with a brief analysis of the fractal structures caused by self-reproductive knots of time, as they follow their paths of existence. The next chapters will be dedicated to a thorough analysis of the mathematical and logical laws that define the paths of Time Arrows, and how they build step by step those fractal networks we call 'Nature'.

Since all what exists studied in detail is a cellular network of self-similar beings sharing energy and information and reproducing and evolving in social networks.

Recap. The Universe is a fractal of information that reproduces, by imprinting and breaking vital spaces into complex forms. Each fractal knot of Time Arrows performs in his search for exi=stence a series of paths and reproductive and social acts whose final result is the creation of a fractal networks. All what we see are fractal networks caused by those knots of time.

**46. The Universe is a fractal of knots of Time Arrows.**

It is now clear what reality is: a series of knots of Time Arrows, which latter we will formalize as 'Non-Euclidean points'. Such points are in constant communication with self-similar points, reproducing their form and evolving socially into networks. The reproduction of form takes place in a fractal manner, by producing 'seeds' in a microcosmic, 'lower scale of existence', which latter grow. The networks are built with flows of energy and information that tie those points. And the result of those simple, yet repetitive processes of reproduction and social evolution is the creation of a world of 'herds', 'cellular organisms' and networks, extending through multiple scales of size in which the forms of energy and information and the structures and laws that build super-organisms remain invariant.

In physics, scientists talk of the invariance of motions discovered and generalized by Galileo and Einstein (Relativity). Yet we must ad in the fractal paradigm two new invariances, the invariance of scale – the same Time Arrows take place in all scales; and the invariance of topological form – the same shapes of energy and information emerge and repeat themselves in all scales (though, and this is essential for the reader to learn how to compare them, they are topological forms, where the 'distances' and sizes are relative, so what is conserved is the overall 'lineal, planar shape' of energetic functions, such as lineal limbs, lineal weapons, planar membranes; the cyclical, toroidal shape of reproductive cycles, which combine energy and information to recreate a form, such as those of your body organs or the cycles of an assembly factory or a mitochondria, and finally the hyperbolic, convex, warped, cyclical forms of informative organs, such as a brain, a camera or an eye or a black hole.)

*Those 3 invariances* create a new 'paradigm' of science, no longer built on the belief of a single arrow of time, a single space-time continuum and a single clock-speed to measure it. The result of course is a more complex reality, but that was to be expected. We, humans are just one of the many games of existence of that fractal Universe, and it should not be expected that we are, regardless of our anthropomorphic myths, different from the rest, and able to fully understand in the diminutive brain all what exists, unless we simplify it.

What this work tries to do is to return to a minimal degree of complexity to be able to understand the fractal knots of times, which imprint the energy of reality with its information, constantly reproducing their form and playing the game of existence, constantly achieving the immortality of form.

The Universe is made of 'time fractals' that participate both of the properties of mathematical fractals and living organisms. Yet organic fractals are more complex than mathematical fractals, because they have motions. And so the reader should not confuse both terms.

Fractals are mathematical or organic forms which constantly iterate or reproduce their information in self-similar forms that extend through several scales of size and information which we shall call 'i'-scales.

They are the most accurate models to depict natural phenomena related to informative growth and reproduction, the essence of life organisms:

*Arrows of Reproduction & Information: ->Δi*

All fractals are originated by a Generator Equation (mathematical jargon) or mother cell, M©, (biological jargon) that iterates=reproduces a series of self-similar fractals called a set in mathematics or a family in biology:

*Mother/Generator Cell: ->Σst-1 fractal family/set*

The paradox of fractals is that the smaller the fractal scale is the more information it accumulates and the more detail it has. How this is possible? Obviously because information is form-in-action, form with motion, and so the logic paths that systems use to process information are completed faster in lesser space. Further on, in physical systems the cyclical speed and frequency of a vortex with form (a mass or an eddy) increases when the vortex is smaller (VoxRo=k). So the increase of 'cyclical speed' diminishes geometrically with size. This result can be generalized to any system of knots of time. So the metabolism of small animals is faster than that of big ones. The cycles and clocks of atoms are faster than those of our scale, faster than those of the cosmological scale.

The same can be said of geometric fractals: When we observe a Mandelbrot fractal, information multiplies in smaller regions as we approach them.

However, there is a fundamental difference between the logic, linguistic fractals of the mind and the physical Universe: While static, ideal, mental mathematical forms can be of any shape, as movement and friction don't test their efficiency, in the Darwinian Universe only forms of Nature whose properties allow the being to process efficiently energy and information, survive. Thus, mathematics is an ideal language that can create any form, but in the Universe forms have to be efficient in their motion/function and parallel form. Thus, in Physics and Biology we add movement to the mental shapes of geometry, which enormously reduces the possible shapes. Movement acts then as a 'reality check', an Occam's razor that eliminates all complex forms, which won't be able to move properly under friction, stress, turbulences and other obstacles proper of the real world. A Mandelbrot fractal might be very beautiful. But it wouldn't be able to move very fast, and its attached microforms probably would break with an air stream. So there are no such fractals in the Universe. Instead, we find physical entities made of cycles and lines in movement, for reasons of biological efficiency. Since a lineal movement is the shortest, most efficient path between 2 points. On the other hand, information is cyclical, because a sphere accumulates the maximal quantity of form in minimal space. While a cyclical rotation is the movement with less friction and the only one, apart from the line of energy, that maintains the self-similarity of any form, even in trans-form-ations of size. A fact that explains, in terms of survival efficiency, the morphological invariance of energy and information shapes at scale.

Since Mathematical fractals lack, as pure forms of mental information, the energetic dimension of movement and growth, their fractal sets are attached to the Mother- cell's boundary, where the self-similar forms nest, as in the case of the well-known Mandelbrot set. On the other hand organic fractals not only iterate their information as mathematical and mental fractals do, but also make it grow. Species are not mathematical but organic fractals, whereas the word organic refers to the non-mathematical properties of existential entities, which are better described with visual and logic/verbal languages. Those Biological theories of Time (Evolution theory, Theory of Organisms) include also the logic of survival that extinguishes the less fit – hence a relative past species - and reproduces the fittest, hence the future species; and it includes the visual languages that give movement to the forms of energy and information described by mathematics.

*Nature's fractals combine the arrow of energy and the arrow of information in an organic way.* They differ from geometric fractals in their dynamism and capacity to absorb energy from their environment. They not only iterate their form in microcosmic scales, but feed their offspring of information till they grow into full replicas of themselves. It is precisely the combination of both arrows what makes the behavior of an organism more complex and varied than the behavior of a mathematical fractal. So in the study of natural fractals, we have to add to the informative arrow - whose laws we deduced

from the study of mathematical fractals and informative seeds - the energy arrow of entropy that thermodynamics has analyzed:

*Energy, young arrow:* $e_{->\infty} x\ i->_0$ X $e_{->0}\ x\ i->_\infty$:
*Information, old arrow*
*For any Σ number of cycles: ΣE x Σi = Organic fractal*
*ΣE<+>ΣT Organic cycle*

The understanding of fractal processes provides a more detailed, scientific analysis of those processes. In that sense, unable to define information with the same rigor used to define the arrow of energy and entropy physicists have ignored for centuries events connected to the arrow of information (chaos, turbulences, super-conductive and super-fluid phenomena, etc.). Physical events and particles are also subject to both arrows, as everything else in the Universe. Thus we define abstract equations (as the back and forth transformation of energy into mass, $E=mc^2$) in terms of process of creation and destruction of information.

As a rule languages will never be able to describe all the information that a certain being has within itself. So mathematical languages are also synoptic, and reduce the total information of the being. And that is the case of a fractal equation, which reduces the entity to its fundamental essence. In that regard, the Theory of Time Arrows is not Pythagorean, as Quantum Theories often are, in the sense that it does not consider the Universe to be made of mathematical entities, but merely affirms that among the linguistic mirrors that can map out the Universe, mathematics is undoubtedly the key language to represent the trajectories, cycles and motions of its species.

Because all languages observe the Universe, we talk of those arrows of time in logic, verbal and visual, formal terms. Since the syntax of verbal thought with its ternary structure and of visual forms with is line-cycle-wave structure and red-green-primary colors describe entities constructed with those arrows.

*Recap*. The Universe is based in 3 types of invariance, invariance of motions (Galilean relativity, now applied to the invariance of the 4 arrows/motions of time), invariance of scale (self-repetition of the same processes and arrows in all scales of size) and invariance of topological form (self-repetition of the energy and information shapes of reality. The 3 invariances define a Universe better described with the mathematical laws of fractals geometries, based in the existence of a generator equation that constantly reproduces information, creating networks of self-similar points, which structure all realities we see. The difference between a mathematical and an organic, Universal fractal is evident: organic fractals do have motion and their processes of reproduction and evolution are far more complex than those of mathematical fractals. So we must depart from a narrow-minded mathematical-only approach to study those fractal systems and consider mathematics one of the main but not the only language to describe its organic properties.

**47. The 3 elements of all fractal beings.**

We see a static, simple Universe in our relative human 'plane of existence'. Yet reality is organic, extended from microcosmic to macrocosmic 'dimensions or scales', and dynamic, as all particles and forces have movement-energy and form, in-form-ation; and all of them are structured into networks, which share their energy and information.

Those 3 elements: bites *and bytes of energy and information; networks and scales* define the structure of all natural fractals, including the Universe.

They can be formalized with the Generator Equation we use to formalize the arrows of energy, information, reproduction and social evolution. Since *we defined Universal fractals as 'fractals of Time Arrows', hence both concepts a fractal Universe and a Universe made of knots of self-repetitive Time Arrows are the same.*

We observe different degrees of complexity in a chemical or mathematical fractal, in a fractal organism or in the fractal Universe; but those 3 essential elements repeat themselves, to the point that scientists use similar terminology for all of them:

- The elementary, iterative *unit-cells* of a fractal, which

according to the duality of Universal arrows, will consist on relative bites *of energy and bytes of information. Those bytes and bites are not static forms, but arrows that exchange energy and information; flows and cycles that the organism repeats constantly, generating self-similar forms.* So we can define a simple iterative, cyclical equation with 2 terms, the 2 arrows of the Universe, which can be considered the generative cycle of all Natural Fractals:

*i: Fractal Cycle: e⇔i (dynamic state)+exi (static, formal state)*

- *The networks or systems of energy and information* that organize those cells into bigger structures.

How feed-back cycles of energy and information grow into complex organisms, made of many cycles?

-In time through processes of discontinuous reproduction and evolution, which create similar action-reaction cycles, cells and organisms in other parts of the Universe. Most natural fractals have a dual network structure that attracts the micro-cells of the organic fractal by distributing the 2 arrows of energy and information to them. For example, in a human fractal, the nervous system delivers bytes of information and the blood system delivers bites of energy, control together its cellular units. In the Universe the same roles are played by the informative, attractive, gravitational force, and the electromagnetic energy forces.

-In Space through the organization of cellular networks that deliver energy and information to each cell-cycle. Those cell-cycles attach to the networks *to process constantly new energy and information in their iterating cycles*, creating bigger organic systems, made of multiple, similar forms.

When both iterative processes are combined, the fractal units of the Universe *grow in energy through space and evolve its informative complexity in time*, giving birth to the infinite combination of those fractal arrows that we call species, systems or organisms.

We include in the equation an Σ-term to signify the gathering of individual exi units into networks and webs:

*Σi: Fractal networks: Σ (e⇔i) or Σ (exi).*

It still looks a simple equation to generate the Universe in its infinite variety. But the Complexity that arises from such simple scheme is enormous when we introduce the 3rd fundamental concept of fractal structures: Dimensionality. Since indeed, space-time cycles can exist theoretically in any number of dimensions. So we should consider in more detail the 3rd element of fractals: the fractal dimensions, planes or scales of existence invisible to human perception through which the fractal exists. They are:

- i: *The relative st-scales or dimensions* across which fractals extend its organization. We use for the 3 relative scales of size that define most Nature's fractals, the symbol i for information.

In humans there are *3:* the cellular, individual and social scales; as most entities do not exchange energy and information beyond its upper and lower organic level. For example, humans, as individuals belong to a relative st-scale, and are aware of social tasks (our st+1 plane of existence) and cellular sickness (our st-1 plane), but the events that affect the galaxy, the macrocosms to which our planet belongs (st+2) or affect our molecules, the lower microcosms that make up our cells (st-2), hardly affect our existence. Thus depending on the detail and scale at which we observe most fractals we perceive a fractal cycle (minimal size and detail), a fractal cell or a fractal organism (max. detail and size):

*Natural Fractal= ΣΣst-1 Cycles > Σst-Cells->st+1 Organism.*

How many elements in space make up a fractal, social network? The most obvious structure is a 'tetrarkys', already considered by Pythagoras to be the magic number of the most perfect social networks. The reason is that a tetrarkys can be written as a system with 3x3+st elements. Imagine then such

tetrarkys as a triangle with 3 vortices, each with 3 elements that will perform the arrows of energy, information and reproduction, while the central st+1 element that communicates all others will perform the arrow of social evolution, representing the entire fractal as a unit of the next st-scale. Thus a tetrarkys is a highly efficient form, found in all systems of nature, even in human, social systems: 9 soldiers and a caporal make a platoon and 9 caporals and a captain a division.

*Recap:* All fractals have 3 elements that define them: Cellular units, networks of energy and information that organize those cellular units, and st-scales in which a self-similar but not equal fractal structure emerges, once and again with the same energetic and informative complementary forms.

**48. Fractal Reproduction of information.**


*A mathematical fractal like the Koch curve is an energy line that triples its in-form-ative bytes every iterative cycle. But since it doesn't grow in length, it exhausts its energy. An organic fractal also starts as a single cell that clones its in-form-ation. But since it can absorb energy, it can iterate billions of times. In both cases what defines a fractal is its reproduction of in-form-ation that bends energy into form, creating the arrow of futures. So the abundance of fractals proves the existence of an arrow of information in the Universe. We are all fractals, Cantor dust of energy and information: we fractalize so much that finally we lose energy, volume and return to the dust from where we departed in the process of death. For that reason, the only solution to death by excess of information is fractal reproduction of a younger micro-form, when the being has enough energy to replicate in a discontinuous zone of space-time, ensuring the immortality of its logic in-form-ation.*

The evolution of the mathematics of Time-space requires giving motion to the formal geometry of Euclidean mathematics. This can be done by fusioning fractal mathematics and Non-Euclidean Mathematics. Mandelbrot in the 70s considered the fact that self-repetitive forms diminish and grow in scale maintaining its forms invariant. The why of this grow ultimately responds to the arrows of reproduction and social evolution: A fractal can be seen as a reproductive process, which is common to all generator equations of information of the Universe.

Fractals can also explain in more detail the reason of aging and the life cycle. The 2 arrows of time follow a natural order from yang=young energy into yin=old information, which defines the existential cycle of most beings in the Universe.

For example, the life and death cycle can be explained as an iterative process of reproduction of information that degenerates into aging, when the organism has exhausted all its energy in a 3$^{rd}$ age in which instead of reproducing, it wrinkles and fractalizes its cells.

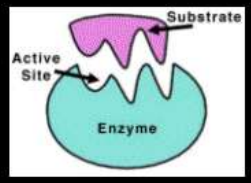
*Recap*. An organic fractal will always try to iterate its form over new energy not to become fractalized. Yet after a young age, even natural fractals start to lack energy end up becoming wrinkled. In fact, all forms in Nature including the Universe in the future big crunch, suffer some aging process, guided by the time arrow of information.

<=>

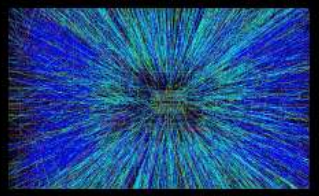
# THE REPRODUCTIVE CYCLE-DIMENSION: EXT

**ORGANISMS REPLICATE ITS QUANTIC ENERGY&INFORMATION THROUGH 3 TYPE OF NETWORKS: ENERGIC=EXTERNAL(CATALISIS), INFORMATIVE=INTERNAL(LIFE) OR EXT COMBINED(SEMINAL JET)**

**I=4:catalysis i=5:enzyme i=6:worker i=6: E=lineal male x i= cyclic female i=1: Particle 1=9: Black Hole**



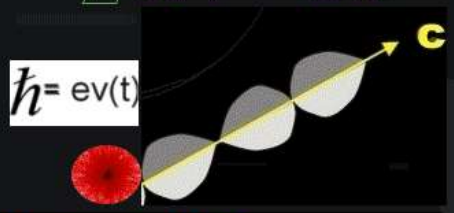




**Molecules, carbohydrates, machines** **Plants & Animals** **i=2,3: Matter i=8,9: Galaxy, Universe**

**SINCE ALL WHAT EXISTS LASTS A QUANTIC TIME SO IT BECOMES EXTINCT IF IT DOESNT REPLICATE:**

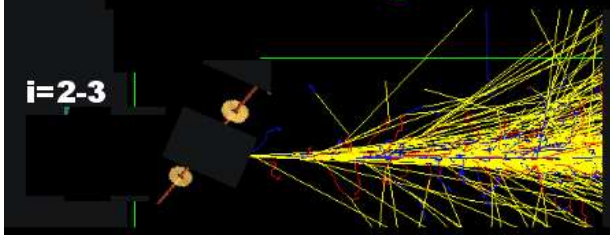
**ovule $\sum$ eti-1 >ETi** **ovule $\sum$ eti-1 >ETi** **ovule $\sum$ eti-1 >ETi**

**i=1-2**



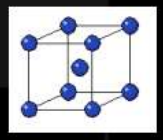

**Planck Photon-> Light wave**

**i=2-3**



**Particle-> Particle Shower**

**i=3-4**




**Crystal Cell->Macro-Crystal**

**i=4-5**

**Dna -> Cell**

**i=5-6**

**Ovule -> Plant**

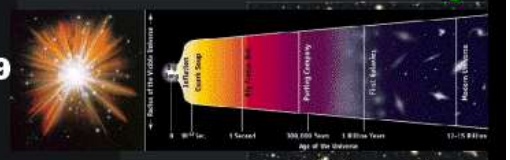
**i=6-7**


**Wor(l)d Code (Prophet)-> Culture**

**i=7-8**

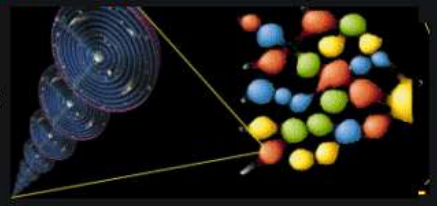
**Black Hole Jet -> Galaxy**

**i=8-9**



**Big bang? -> Universe?**

**i=9-10**



**Universal Black Hole->Multiverse**

## 49. Fractal reproduction in a discontinuous Universe.

In the graph, fractal systems are self-generated by seeds of its cellular scale, which encode all its information, compressed in very limited space (an equation, a DNA code, a Unification equation that generates the energy and forms of the Universe). Then the seed replicates its form in 'biological radiations' that multiply the fractal cells of the system, which finally *follow the plan of network evolution of all systems,* recreating the original species. The process follows a series of 'beats' that change the arrow of time of the system from reproductive, energetic waves to informative, self-organizing phases in a pattern proved mathematically for chemical systems by Mehaute, which showed in the 80s that for time to continue when a system was not releasing energy; it had to create fractal information, *the 2nd arrow of time in the Universe.* Thus, the Universe never stops its E->I->E rhythms.

When entropy ceases is because the feed-back equation changed side. In Nature those micro-structures detach themselves from the being and absorb energy in the environment growing in size, self-replicating. So the fractal transmission of form is the most important event taken place in the Universe. From genetic information transferred between living beings through a fractal process of palingenesis to the creation of mental ideas that we convert into bigger machines, fractal replication between different planes of fractal space-time with finite dimensions, is the essence of reality.

Fractal, transcendental reproduction iterates cells and reorganizes them in decametric scales of growing social complexity till reaching a limit number of $10^{10\text{-}11}$ cellular units. The organization of those scales follows a simple law:

*Energy flows from $st_{-1}$ into a future st-scale: $E_{st-1}$->$I_{st.}$*

*Information flows from st into a simpler $st_{-1}$ scale: $I_{st}$>$E_{st-1.}$*

*Reproduction happens in the same st-scale $\Sigma S_{st}$<=$I_{st}$*

Since those planes are networks existing with different space-time constants, disconnected from the other planes, how a given space-time scale, the cellular or atomic scale, relates to its higher st-plane? Riemann hinted at such scalar structure of space with his analysis of Riemannian surfaces, polynomial planes which communicate through a narrow path that transfers energy and information between them. Those paths between light and gravitational space are in Relativity 'Rosen Bridges' - black holes and other massive regions of the Universe. Yet the concept can generalize to any dual system, in which there are asymmetric flows of energy and information, according to a fundamental law of fractal space-time:

Information flows from the macro-plane of relative future to the micro-points of simpler energy and energy flows from the micro-points, st-1 from past to the relative, more evolved future macro-points, from the microcosms to the macrocosms.

Thus there is an asymmetric, hierarchical single flow of information from a relative future, the higher st+1 plane, to a relative past, st-1 plane and vice versa, a fact which explains the lack of parity of 'temporal, informative flows' (weak forces in physics, hierarchical social classes in sociology, etc.)

Thus the order between those scales is hierarchical. Species in different planes of space-time interact within each other transferring energy and information. Yet the bigger structures control and order the smaller pieces - its parts that become wholes through the arrow of life or disintegrate those wholes back into parts through the process of death. Such interaction is possible because in those different Planes, from microcosms to macrocosms, energy and information have self-similar forms that make the shapes of atoms similar to the forms of galaxies and stars. And follow self-similar laws of harmony. In terms of hierarchical order, we observe that the bigger an entity is in space, the longer it lasts in time, $\Sigma S \Leftrightarrow Ti$. That is, the amount of time and space of the different structures of the universe is in balance. While in terms of hierarchy the bigger scale orders and transfers information to the smaller scale that transfers mainly energy to the bigger form. Those 2 arrows of time, energy and information imply that the bigger scale or network – for example, the nervous system in man – controls the lower scale of cells, which in turn feeds the upper scale.

So we describe Temporal, Organic fractals with 2 terms of increasing complexity: a fractal system or network, which is incomplete, since it doesn't reproduce internally and might not be able to self-organize itself, but requires the collaboration of an external agent; and a (super)-organism in which the arrow of reproduction is internal, iterating the initial fractal units of energy and information into 2 networks that finally combine its energy and information creating the 3rd reproductive network that perpetuates the self-sufficient species.

In biology such processes of self-organization and reproduction of parts into wholes are called Palingenesis – a term, which complex sciences that use both the jargon of physics and biology, extracting self-similar laws that apply to all those scales, uses also to describe physical processes of creation of matter and social processes of creation of cultures. Since all social and physical systems display complex, palingenetic behavior, from physical particles to organisms, from minds to nations. All of them constantly reproduce seminal information - called actions of energy and time in the quantum world, offspring in living organisms, ideas in the linguistic mind, technology and culture in human societies. And in all those cases, the seminal information grows into a species self-similar to the mother. So forces reproduce particles, cells become organisms and nations create self-similar cultures, called colonies. All of them are organic fractals whose different planes (the cellular, individual and social planes) are connected by flows of energy and information: Life reproduces in a smaller space-time plane ($st_{-1}$) seminal seeds that grow into replicas of original st-mother; human existence is a travel between 3 Planes of relative existence, the cellular Plane ($st_{-1}$), the organic, individual Plane (st) and the social Plane in which a human can be considered a cell of a social organism, a nation, religion or civilization ($st_{+1}$). But electrons (st) also produce smaller photons ($st_{-1}$) that evolve into new electrons, which become cellular units of electric flows ($st_{+1}$); while galactic black holes (st), made of billions of social quarks ($st_{-1}$) emit flows of matter that evolve into new galaxies, cells of Universes ($st_{+1}$). Thus, Social Palingenesis explains also why in all the scales of the Universe, the geometry of energy and information remains invariant; since a $st_{+1}$ Plane is born by the social evolution of energy bytes and information bytes of the inferior Plane, which repeat its self-similar forms in all the multiple, self-similar relative 'planes of existence' of the universe, from the atom to the galaxy, from the cell to the factory. Thus, social palingenesis is not exclusive of living organisms. All systems display those complex, social Planes. The 2 simplest particles of the Universe self-reproduce and socialize: quarks absorb energy and reproduce smaller quarks. Electrons produce a seminal light ray that becomes a new electron. So happens to the heavier form we know: the black hole, which reproduces its form when crossing through a star. Even the Universe is a space-time fractal, which might have reproduced its 'cellular' particles in the big/bang.

*Recap*. All systems of the Universe reproduce through a fractal, palingenetic process, in which the system produces a seed of information that reproduces and evolves socially till surfacing in the same plane of existence that the parental form.

**50. Complex, reproductive motions.**

In the Universe there is a simplex cycle, e⇔I, that converts lineal motions into cyclical motions, and can at best be made to exist in 3 dimensions (spherical motions) of space and 3 of time (expansive youth, or big-bang, steady state and implosive 3rd age). Yet complex motions - acts of reproduction and social evolution - are different from simplex motions, in as much as they take place between at least 2 planes of different space-time. This difference between the simplex and complex arrows of time creates jumps between space-time planes:

The most complex phenomenon of the Universe is the fractal jump in space-time. Both bidimensional cycles of time, and planes of space are fractal and so their changes and displacements are also fractal. And since time is geometric, bidimensional, as space is, it has also 2 directions of motion.

So the oldest fractal question of philosophy is: how can continuous movement exist in a fractal world filled with

discontinuities? Zenon, a Greek philosopher, put the example of Achilles running against a Turtle: Achilles will never reach the turtle because there are infinite fractal spaces it has to cross. Parmenides gave him the answer: continuous movement doesn't exist in a discreet Universe; it is a mirage of the senses. Since a wave is not really moving, but reproducing information over the potential energy of the vacuum in a sequential, fractal jump, through a series of wave-lengths, drawn one after another, which appear to the senses as a moving wave. Movement is always a discontinuous displacement either in space or in time, in any of its 2 directions, towards the past or the future. The simplest analogy is a television screen where new images are created constantly without hardly any cost of energy, because they are virtual images created by illuminating 3 colors that are already potentially in the screen. In the case of a wave, the relative energy imprinted by the logic form might vary, from the vacuum energy of a light wave to the placental energy of a mother, yet the process is always the same: a form imprints another region of space, changing its spatial position and temporal morphology. *So speed is synonymous of reproduction, the main cyclical action of the Universe. Thus we can explain all physical events in terms of organicism. Since even movement - the external, mechanical change physicists study - turns out to be also an organic cycle of reproduction.* We distinguish, according to their quantity of energy and information 'translated' in the process from a place of space-time to another place, 3 fractal, reproductive jumps:

- *E=I: Space-time reproduction* dominant in spatial displacement that implies a minimal movement of information that fluctuates from a future to a past form and returns back to the future. For example, when an electric impulse arrives to the end of a nerve, it becomes translated into chemical information and then it is transferred chemically through the synapses to the other cell, where it becomes translated back into electric information. That process implies a 'spatial, fractal jump' from a neuron to the next neuron, but also a fractal jump in time from a level of informative complexity, the electric language to the lower level of chemical languages, which is the relative, past informative system of life. The informative essence of the process implies a transcription of form from each discontinuous point to the next point but also a movement in space, since 'all yang has a drop of yin', all is temporal energy, also spatial and temporal reproduction requires a minimal dual movement in time and space.

-*Max. E: Spatial, wave reproduction* of a wave a particle that jumps from one place to the next place, reproducing a minimal temporal form. It is very common in physical waves, defined by its speed of reproduction, V=S/T. Depending on the density of a form, its speed of reproduction will vary. So the most massive forms are slower than those whose informations are minimal and can imprint the energy of vacuum very fast. Those forms that hardly move however evolve a lot in time:

- *Max. i: Temporal, palingenetic reproduction*, when an organism produces a past, smaller, simpler seed that reproduces the being, evolving faster towards the future. So a foetus is 'born' when it comes out of the body of the mother to the next discontinuous region of the Universe, making a minimal spatial jump and a huge evolutionary, temporal jump.

*Recap*. There are 3 types of reproduction: self-reproduction by a complementary system that mixes its energy and information, without concourse of external agents; spatial reproduction, or motion of a wave that imprints a simple form of energy as it translates in space and enzymatic reproduction when an external agent assemblies the parts into a whole.

**51. Reproduction of physical, biologic and mental fractals**

*In graph, cosmological, chemical, biological and mechanical fractals during their reproduction cycles.*

All fractals iterate=reproduce by absorbing energy transformed into fractal information by a Mother cell or external enzyme- as it

happens with carbohydrates or machines iterated by ‘enzy=men’.

Unlike mathematical fractals, made of fixed, spatial forms, Nature’s fractals are made of temporal, iterative cycles, in which energy is transformed into information and growth, as the fractal family becomes detached from the mother cells. Organic fractals are not fixed, geometrical forms that merely repeat in spatial scales, void of life and temporal change. They are *temporal beings, whose bio-logic cycles and functions* reproduce at different scales and time intervals. Since not only space has a fractal structure. Time is also discrete, made of cyclic trajectories that repeat themselves, as it happens with the cycles of a mechanical clock. It is precisely the repetition of the organic cycles of energy feeding and informative reproduction, what makes natural organisms fractal structures. The Universe is made of such temporal, organic fractals that reproduce into multiple clonic forms that latter re-organize themselves, giving birth to macro-forms similar to the original ‘cell’.

The most obvious natural fractals are those created by the iterative, repetitive nature of 3-D space. They are similar to mathematical fractals where geometrical form dominates.

For example, an ice crystal *is a chemical fractal* that jets up triangular, tall spikes, in its relative dimension of height, growing into a fractal; a *salt grain* is a cubic crystal that reproduces its form as it grows in scale and recomposes itself into huge cubes. While a hurricane fractalizes air streams into a vortex of wind cycles that grow also in height, the fractal dimension of information. Those physical fractals already iterate its form, despite the simplicity of its fundamental elements; since all natural fractals reproduce the shape of the ‘mother-cell’ into multiple clonic forms that latter re-organize themselves, giving birth to macro-species similar to the original ‘cell’.

*In Biology, fractals are used* routinely to explain how the iteration of simplex growth processes gives birth to complex botanic shapes: Branches, leaves and roots are all easily created by the iteration of an initial mother-form. A DNA molecule, which iterates its form both in micro-fragments (amino acids) and at macro-scale (recreating a cell). While a tree repeatedly fractalizes its form in 3 branches, ever slimmer, with less energy but ever increasing the information of the tree.

A *human being is also a temporal fractal*, made of fractal cells, whose organic functions repeat themselves at individual macro-scale in a longer time-interval: the feeding, reproductive, informative (sensorial), and social behavior of human beings are a macro- repetition of the same cycles that take place in cells. Cells feed on energy, absorb information, reproduce themselves and form social groups, as human beings do, at a smaller, faster scale. The fractal sum of those cellular cycles creates a human being. And then, the fractal sum of human cycles at a bigger scale creates socio-biological organisms, called nations and civilizations. A human is an organic, bio-logic, temporal fractal, extended in 3 scales, the cellular, organic and social scale.

*Recap*. The arrow of information and entropy together describe all kind of natural fractals, not only the well-known biological fractals but also social and physical systems that display complex, fragmented borders, (from physical particles to organisms, from minds to nations) and constantly re=produce information (actions in the quantum world, offspring in living organisms, ideas in the linguistic mind, technology and culture in human societies). They are also organic fractals, since once we understand their structure in multiple scales connected by flows of energy and information, the old distinction between organic and inorganic matter loses its meaning, beyond its anthropomorphic role to make man the center of the Universe.

### 52. Linguistic fractals. Paradox of inflationary information.

Minds can also be modeled as fractal systems that replicate the forms and movements of the Universe in a smaller scale, through the syntax and semantics of a certain language. Indeed, modern science concentrates in the study of the parallelisms between the hardware of the mind, the neuronal brain, and its software, the depiction of the Universe made with visual and verbal languages. But what truly matters is the bio-logical parallelism between those mental structures made of syntactic and semantic, fractal units (numbers, geometrical forms, phonemes and sentences), and the

external Universe they map out. Since organisms survive thanks to their accurate, mental perception that orientates them in that bigger Universe. So fractal minds are a fundamental tool of evolution: The mind acts as a virtual, fractal mirror, allowing the being to interact efficiently with the Universe, absorbing energy and information from it to replicate its form. This means that we can study minds as mental fractals similar to its 2 main languages of space-time; mathematics and logic.

For that reason, mental and geometric fractals are both defined as entities whose informative boundary tends to ∞ while the energy/space of those boundaries tends to zero:

$$\delta e/\delta t \to 0 \times \delta i/\delta t \to \infty$$: *Mental Fractal.*

Thus the information of a mathematical fractal is found in the boundary. It happens also in black holes, where information is attached at the boundary in a bidimensional space (holographic principle, which we proved in a simple manner as result of the 2 dimensions of a cycle of time that carries information and now we can observe from a more complex perspective). It is also the case of the human mind, an i=eye+wor(l)d, created by the eye's retina and the electromagnetic waves of the cortex brain. Thus the informative parts of organisms, what we call 'senses', are also external, attached to the boundary and one of the fundamental functions of Nature's fractal arrow is to create senses, systems of perception of fractalized information. Minds and senses are similar to mathematical fractals. It should not come as a surprise; since mathematics after all is a mind's language, and minds fix most cycles of Natural fractals into still images that don't capture the vital energy of the Universe.

Mathematical and real fractals share the properties of information, inverse to energy. Information increase when the fractal becomes smaller in its surface. This paradox, that the smallest regions of space hold the maximal quantity of time: Max. I =Min. E is however essential to full grasp the Universe.

Languages hold more information than the forms they describe. Information is bidimensional and can be warped and cut. This essential property, that information is in the void, the cut, not the substance, as it will *be first perceived by a mind in order to exist, and so it is not real till the perceiver observes it (quantum paradoxes), is* however the reason why the smaller regions, in which voids multiply are more conductive to information frequencies that long ones. This paradox already understood by Gödel simplifies the distinction between mathematical physics and reality. Information is inflationary.

The Universe is not all the possible mathematical models. As Riemann, the key mathematician of the XIX C. explained, we cannot consider all possible spaces real, because the physical universe has selected only one geometry[6], to which we shall add – it selects the most efficient geometry that maximizes the 4 main arrows of time of species and helps the organic, Complementary, exi, bio-logic forms of reality to survive. Unfortunately neither mathematicians nor physicists today accept restrictions to their imagination, so they invent 'multiverses, cosmic strings, multiple, infinite dimensions' without 'upgrading' the concept of a continuous space into the reality of fractal discontinuous scales. The confusion of languages with reality is one of the main 'errors' of science we must resolve in order to improve the 'logic/mathematical mirror' the mind uses to perceive reality.

This distinction often lost to physicists in modern times, clearly expressed by Riemann in his 'foundations of geometry' and further proved by Gödel implies that not all possible mathematical spaces and mathematical particles exist. The space of the Universe is far more restrictive in form and dimensions than the space of mathematicians. Why this happens can be explained 'bio-logically' by the fact that the inverse function of existence, extinction, eliminates all forms which are not efficient even if it creates them a priori – in the same manner all mutations in Nature, which are not efficient disappears. While our informative mind keeps producing imaginary models of geometry, which are pumped up by the scholar who seeks to convince the world his geometry is also right. For example, in the field of physics, multi-universes, super symmetries, entropy in black holes, etc. are mathematical theories with no

equivalent in the world because they ignore the arrow of information in mass and the need for no more than 2x2 dimensions to construct the Universe.

While the Copenhagen interpretation of quantum physics in which an organic wave of photons, parts of whole electrons, guided by the $4^{th}$ arrow of organic evolution is considered a herd of 'probabilities' is wrong. As in the case of the Mandelbrot set that doesn't exist in nature, unable to resist energetic motion, in all those cases the 4 main time arrows of reality and its need to be performed by all entities that wish to exist, limit the information that becomes real.

All this requires understanding 2 of the basic properties of information – the fact that 'fractal information' is constantly created by the motions of reality and the paradox between energy with maximal spatial extension but minimal information Vs. information with minimal energy and extension. In brief, information increases, as in fractals, when we diminish in size. So brains are smaller than bodies but have more information. And a language has maximal information packed in minimal space. A language in fact has more information than a huge surface of vacuum space, which makes theories more abundant than the forms we find in the real Universe. Information is inflationary and so are physical theories with bizarre space/times that reality never will select.

Mathematics is, as all languages, an informative, 'fractal', whose self-similar forms/theories multiply in excess ($\Sigma Se_{->0}$; $Ti->_{\infty)}$. Thus, if certain sentences of verbal thought can be imaginary fictions, despite its beauty, so happens to many 'quixotic' geometrical forms, which do not exist. The Universe selects only efficient geometries, based in forms that can move and perform the arrows of time in the real Universe. So for example, the most beautiful fractal form of the mathematical Universe, the Mandelbrot set, does not exist in reality, because all its small self-similar attachments would easily break if they were moving as reality does.

Hence the importance of having a geometric theory of space-time that describes accurately the forms of the physical Universe. This was the key discovery of Einstein. He realized that Euclidean, lineal geometry, used to describe ideal space, could not describe the cyclical paths created in gravitational space-time. So he switched in his description of reality to a space called Non-Euclidean, where its minimal fractal unit, the point, could be crossed by multiple gravitational curves and hence, unlike the abstract point of Euclid, it required inner volume, inner form and energy. This point, *which has always in Nature a region that can absorb /gauge information and a lineal or cyclical, rotational motion*, is what we call a Point of View= Measure or Non-Euclidean point of view, the relative unit of Non-Euclidean mathematics.

Philosophers of science have wondered often if mathematics is merely a construction of the mind or an image of reality and why they are all pervading in the description of any 'system' of self-similar forms in the Universe. The answer is both: languages are construction of the mind that reflects the external universe's information in a small space, hence they must reduce the total information to fit the mental mirror, trying also to make an image the closest possible to reality. This is what logic languages do with time and mathematical languages with space; because the Universe is logic-mathematical, albeit of a type of logic and mathematics more complex than the abstractions without motion devised by the Greeks 2300 years ago. Indeed, the same concept applies to the new logic of time, which is based in multiple causality, either a dual 'biological causality' in A<->B events in which an element A is predator and the other B victim; hence B is considered by A mere energy when B considers itself an informative entity worth to exist (so A is both A and B, victim and predator, energy for the predator information for the I-self of the victim); or 'multiple, spherical causality', when multiple agents create a certain network or form. So for example a real circle is not drawn in abstract by a single pen, but happens when multiple self-similar points of view converge and form a cycle.

Ultimately we are all made of spatial energy and temporal information, whose synoptic descriptions are achieved with 2 languages, mathematics and logic. And so the search for knowledge by the human mind is not only the recollection of experimental data,

but its description with the languages of mathematics and logic. Hence even more important than the collection of data is the creation of a mental container – those 2 languages – efficient and evolved enough to fit properly all the data of reality we observe. Yet since the revolution of thought represented by Evolution Theory in Biology and quantum /relativity in physics, there is a gap between the behavior of universal entities and the linguistic syntax of mathematics and logic, hardly evolved since 2300 years ago, when Euclid and Aristotle founded those 2 sciences. Thus, we shall in this work summarize the new advances and laws of spatial geometry and temporal logic that are needed to describe a complex Universe of multiple, fractal space-times in which points are Complementary systems – entities that gauge and feed on energy with an informative and energetic center (body/brain, field/particle system). What still stands is a simplification of reality to 'fit' it into the mind. So while we are not concerned with the specific energy and information the point of view process (the details that don't fit), we cannot longer hold truth the syntactic errors of Euclidean mathematics (points, lines and planes without breadth, width or height), and Aristotelian Logic (single causal events of the type A->B).

We call the evolved syntax of those 2 space-time languages, i-logic geometry, or simply i-logic geometry (as i represents 'information' and it is the next vowel after the A-ristotelian and E-uclidean languages used till now. Yet it also represents a 'complementary system' with a cyclical, informative 'head', O, and a lineal, energetic 'limb-body' |, which are also symbols used in 'complex algebra' to represent energetic and informative functions)). Thus, we affirm that the Universe of multiple space-times follows *the complex logic of information or* 'i-logic, fractal geometry' pioneered in the XIX and XX C. by Darwin, Riemann, Planck, Einstein and Mandelbrot whose discoveries were the first steps of a 'new paradigm of science', which this work completes, upgrading philosophy of science (mechanism and monism), stuck in Aristotelian, Euclidean theories since the XVII century. So we shall talk often of the 'i-logic, fractal paradigm' as opposed to the 'A-logic, Euclidean paradigm' of a mechanical world of single 'ceteris paribus' causes and entities which are supposed to exist in a single, continuous, abstract, non-moving space.

The second part of this work after this brief introduction to 'metaphysics', the description of the ultimate meaning of existence – the accomplishment of the 4 main arrows of time – will be dedicated to the development of those new formalisms of mathematics and logic needed to make detailed, rigorous analysis of the events and forms of natural, organic fractals.

In that regard, since all languages are fractals of the entire Universe perceived in a slower, shorter, memorial pattern, a mirror of information with less dimensions of 'motion' and 'form' than the original. So these texts could be also considered a fractal, linguistic mirror of all Realities.

*Recap:* Information is inflationary. So are informative languages, reasons why we must differentiate fictions from theories that truly describe the universe. Multiple Spaces-Times improve our logic and mathematical tools to describe the Universe. This is done advanced the Aristotelian logic and Euclidean geometry into the next vowel of the alphabet: i-logic geometry, the logic and geometry of information.

**53. Man is a fractal organism.**

Man as a fractal is made of cellular units and networks of energy and information (nervous and blood systems), whose cycles and functions extend through 3 main st-scales: the cellular, individual and social scale. A human being described as a fractal will be composed of:

- *DNA cells*, the Mother cells of the human fractal, whose genetic functions and forms repeat themselves trillions of times, composed of informative units (the DNA genes) and energetic ones (amino acids, bricks of genetic reproduction).

- A palingenetic process of reproduction and differentiation of those cells, which latter gather into energetic, reproductive and informative *networks*: the digestive, blood and nervous systems that create a human.

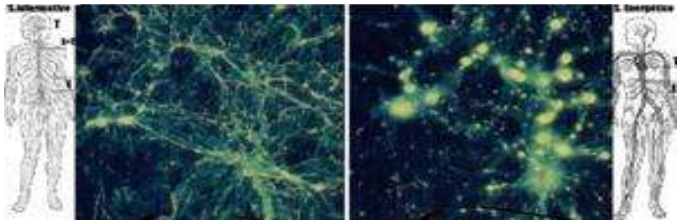
- The scales that group DNA molecules into cells, which gather themselves into organs, which gather themselves into physiological systems, put together into a human being.

Those scales break further in ternary and decametric systems: man has 10 organic systems, 10 fractal fingers, 10 glial cells feed a neuron, etc.

Of all the possible fractals that can be described with those 3 elements I share the fascination of Kant for what is inside the mind of men and what is above it, on the skies. So we will dedicate most of the pages of this work to study those 2 fractals, man and the Universe.

*Recap*: Humans are fractals of energy and information defined by the 3 elements of all fractals, cells, scales and reproduction.

**54. The Universe is a Fractal organism.**



*The Universe and man described as fractals, whose cellular units are blood and nervous energy/ information networks and informative masses (MACHOs, quark stars?) and light galaxies that shape 2 networks of radiant energy and dark, informative matter. Each point of those 2 networks (compared to the similar networks of a human organism) represents a galaxy.*

The Universe can be described as a fractal, based in the existence of the 3 elements that define all Natural fractals:

- The Universe has 2 networks, one of electromagnetic energy and one of gravitational information (black holes, dark matter) that controls the electromagnetic world. It has also informative vortices (masses and charges) and lineal forces.

- Its fundamental particles, quarks of mass/information and electrons/photons of electromagnetic energy can absorb energy, gauge information and reproduce self-similar particles.

- The structure of those particles and forces is scalar: lineal forces of electromagnetic energy and cyclical particles of gravitational information grow in scale and size, from the tiniest lineal and cyclical strings, which are so small that we cannot perceive them, to the atomic scale of lineal forces (light, gravitation) and cyclical particles (electrons and quarks), to the cosmic scale of gravitational and electromagnetic fields, caused by spherical, celestial bodies (stars, black holes and planets), creating the macrocosms we perceive.

The galaxy has a dual network of informative, black hole masses and electromagnetic stars, which are the cells of the informative and energetic networks of the galaxy, join by flows of gravitational and electromagnetic space. And in the same manner, if we take each galaxy as a st-point, we can map out the Universe as a dual network of dark, gravitational information (left side of the picture), which joins the central black holes of the galaxy and electromagnetic energy, which joins the electromagnetic planes of the galaxies (a point in the right side of the graph).

Since systems extend in '4-dimensional space' as a series of networks webbed among them, and in the hierarchical scales of size as a series of parts that become wholes, units/parts of new wholes and in time as a sequence dominated by one of those 3 networks, which will grow from the lower cellular scale into the social scale and die back into the cellular scale. And also we can consider that the Universe will go through 3 ages that correspond to the 3 solutions of Einstein's spacetime equation and start as a relative 'seminal cell' in the big-bang and finally warp into the big-crunch of maximal form.

Bio-chemical and geometrical fractals have been known for a century. But only recently we have studied *the physical Universe as a fractal*, born out of the dynamic combinations of those 2 arrows of time. One of its most remarkable successes is the description of Einstein's space-time continuum as an iteration of some basic

fractal geometries (Nottale). Thus Einstein's sentence, 'Time curves space', means in fractal terms that the arrow of informative time curves the vacuum energy of the Universe, fractalizing it into fractal particles, charges and masses, which are fractal, spiral vortices of electromagnetic and gravitational information. Moreover, if we order the sizes of the Universe in a *decametric scale*, we find that at certain intervals the same forms and functions appear once and again. In the 60s, the American filmmaker Eames made a documentary called 'The Power of 10', in which that iterative repetition of cyclical, spiral forms appeared from the quark to the cluster. In fact, the homology of form and function between those scales is so remarkable that the same equations describe the tiny magnetic field of an electron or a star, made of trillions of particles. Thus, since that decametric scale is the most common scale considered for the entire Universe, we can define the Universe in fractal terms:

*'The Universe is a fractal super-organism made of particles of information and forces of energy gathered in networks, whose formal cycles repeat in decametric scales'.*

While the fractal Universe and the continuous model of the big-bang use the same experimental information, the final outlook is very different. Since the fractal Universe is:

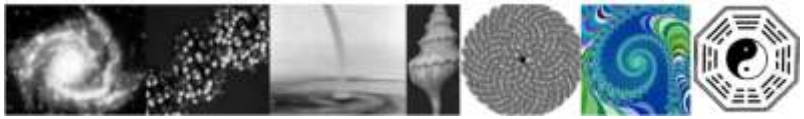
A) Eternal. B) Cyclical. C) ∞ in energy x information scales.

Indeed, even if there were a process of organic reproduction, of a big-bang like radiation of forms and particles over a surface of void energy, this will be subject to the duality of arrows of time, of life and death cycles, of big crunches (life, creation of information) and big bangs (death, creation of energy). So B->A, and since the Universe is cyclical, it is eternal. And so, in a fractal Universe the metaphysical question is: do Universes become 'microscopic black holes', quarks of a bigger, fractal Hyper-Universe? A detailed study of the physical constants and parameters of those particles seem indeed to foresee a fractal Universe, which is not only infinite in its relative spatial size, but in the number of scales/planes of organic evolution, in such a manner that each galaxy could be the atom of a bigger Universe, as it happens in fact in the theoretical models of relativity, (Einstein-Walker model of a Universe made of galaxies, interpreted as 'hydrogen atoms'[13].)

What is the absolute form of the entire Universe? If we observe the previous graph, we realize that the known Universe shows the clear form of an electromagnetic wave, with a wider base shaped by the 'gravito-magnetic' field of dark matter… So we might consider it again a 'point' of a bigger network.

*Recap*: The Universe is a fractal of energy and information that extends in 10 perceived self-similar scales of Euclidean networks in which the 3 invariances of motions, form and scales are kept. But since in the fractal model the parameters of atoms and galaxies are self-similar, the Universe could be infinite in its scales.

## X. BEATS, ACTIONS & UNIVERSAL CONSTANTS



*In the graph, a galaxy, a DNA molecule, a tornado, a shell, a sunflower, and 2 logic, mental mirrors of the Universe - a Mandelbrot set and a yin-yang, eightfold life cycle - are all made of shapes that combine the most efficient morphologies of energy and information: the line or shortest distance between 2 points and the cycle that stores the max. quantity of information in lesser space. Both combine to reproduce the infinite beings of reality. It is the game of existence we all play.*

### 55. A Universe of actions of energy and information.

Once we have established the existence of a Universe of motions in time and forms of space, whose organic parts are guided by the 'will' of the 4 main arrows of time, we can respond to the fundamental questions about man and the Universe - why we are here, what we are. And the answer is obvious: since we are all complementary beings, made of energy and information, we exist to combine, absorb and reproduce energy and information, exi; what we constantly do through actions that imprint our form and deliver it, carried by a flow of energy= motion. We make actions of energy and temporal information. So we often say 'I don't have time and energy to do this'.

This simple expression, exi, is therefore the unit of reality, an action, specific of each species, which will imprint the external world with its form and energy, as many times as it does. Yet actions are also fractal, discontinuous, quantic 'steps'. And so we define for each system, including the biggest systems of reality (the gravitational and light-space membranes we inhabit), a minimal 'existential unit', or action that defines the system:

*Se x Ti=K=Action of existence.*

In all systems we shall find such actions: the h-Planck constant is the minimal action of the light-membrane; in the gravitational world a Lambda-string is its minimal action. When we humans live, we constantly act with 'energy' an time, performing cycles of existence, whose minimal actions is a 'thought', an act of perception (I think therefore I am), which takes a second of time, our existential beat. In Physical systems, actions can also be translated as momentum (m(Ti) x V(Se)); in biological systems, exi will define the 'existential force' of a top predator. In the economic world an action is a minimal quantity of a Company, the Free Citizen of the Economic ecosystem that re=produces machines, money and weapons and structure the financial-military-Industrial complex in which we live. In a wave of light it is the minimal step, as the wave reproduces its form over the surface of magnetic and electric quanta (constants of vacuum). There are in that sense many ways to define an action but in most cases, as its formula indicates, it will be an action of reproduction that imprints a form on a surface of energy; and therefore also the minimal unit of 'form' display but any existential system.

### 56. Mandate of existence: Maximize your Time Arrows.

We inform ourselves in order to absorb energy with the aim of reproducing our organism in other zone of space-time, avoiding in this manner 'extinction', the inverse function of existence - since we are only 'parts' of the total Universe with a limited quantity of vital energy/space and a limited duration of time. So to ensure the survival of our in/form/ation we must either reproduce in other zones of space-time or increase our quantity of vital energy and our duration in time, by becoming a part of a bigger entity, a wave, herd or organism. So our actions become 'bricks', units, frequencies of those 4 main arrows of time. And while all 'yin=information has a bit of yang=energy' and vice versa, we can distinguish those actions by the quantity of energy or information they deploy, within the limits of an action, whose total product is constant

- Max. I x Min e: *Informative action*
- Max E x Min i: *Energetic action*
- E=I: *Reproductive action*
- ∑ e x ∑2i: *Social action*

The sum of all those actions is what all existential beings do whatever type of existence, the entity carries on. All this can be formalized in a simple Mandate, which all the languages, equations and actions of all particles, beings and entities of reality follow: maximize your time arrows, maximize your function of existence:

$$Max. \sum exi$$

Thus, if the Universe can be defined externally, objectively, as a geometry of two inverse motions, energy and information; from the internal perspective of the 'will' or 'why' of those motions of time, the Universe is a game of 'exi=stence', where 'to grow=evolve and multiply' is the meaning of it all.

Some scientists think that this mandate can only expressed in the language of particles and forces, machines and spatial forms, geometry=mathematics. But this is by no means truth. Indeed, all languages of all species, which each particle or entity of reality use to guide its behavior in the Universe express the mandate to its species. As Pythagorism affirms, physical entities are mathematical entities in as much as they use the language of mathematics to gauge energy and information and maximize their exi=stence. This is self-evident. We can describe the actions of physical particles only with mathematics because that is the language which they possess. Probably all particles are like small computers and vice versa. We are about to be able to make quantum computers using the simplest physical particles. But you need then the 'errors' of the Galilean=Ego paradox of Physicists – aka reductionism – not to go further than that, and affirm that the Universe is only mathematics, and that the mathematical actions of particles that gauge constantly information and energy, have no will behind, no purpose, no goal. This of course means that nothing else matter, nor Biology, nor life, nor Humanity and History, because when we enter into those other scales and entities, mathematics is not enough to describe the behavior of humans and living beings. Yet, *with 3x3 time arrows and the mandate of existence, we can still explain all the actions and forms of biology and history*. So according to the Principle of Correspondence, we can consider that mathematics as the language of physical particles and physics, as the science that studies only those particles of information and its forces of energy, are part of a bigger Science of Sciences, the science of Multiple Spaces-Times.

Consider Biological beings. They have a geometrical, topological form, which we briefly described in previous paragraphs and will analyze in more detail. Essentially, any biological being is a complementary being, made of networks of cells that try to maximize the simplex arrows of time: perception of information, with their heads; and absorption of energy with their body. They also try to maximize their complex arrows of time, which are less common (yet still exist in physical particles): the arrow of reproduction and the arrow of social evolution that gathers cells into organisms. Physical particles, quarks and electrons, also reproduce when they absorb a lot of energy and evolve in social networks, molecules, planets and stars; yet their dominant arrows are energy and information, the simplest ones, given their minimal 'volume of existence'. And so E⇔I, the fundamental beat of reality will suffice to explain most physical actions. In Biology though, the dominant arrow is reproduction, Max. exi; and so we shall understand finally the ultimate meaning of theory of Evolution encoded in Mr. Darwin's dictum: A struggle for existence follows from the constant reproduction of species in an environment of limited resources.

The way this fight for existence between species takes place is what Darwin described. The Biological networks or organs of each species (nervous=informative system, digestive= energetic system and hormonal=blood, reproductive system) define its physiology, the key science of medicine and biology at the scale of organisms. Yet, because entities of reality spread over several fractal scales of size, the language that living beings 'speak' to reproduce and create a self-similar entity is the genetic code. And so we have a new language, genetics, which encodes the function of existence of living beings, trying to maximize its reproduction, energy and information absorption and social evolution.

Finally, in the scale of human beings, the main language that expresses the function of existence is NOT mathematics, neither

genetics, which encodes our biological life as individuals, since we are guided in the external, social world, by the arrow of social evolution and the memetic, cultural objects we use to organize societies. Thus, again the language has changed: humans encode their wantings and will for energy, information, social evolution and reproduction in verbal mandates, which are either philosophical, logical, religious or legal codes. So Genesis said 'and God told man, grow and multiply', which again means Max. ExI, reproduce, grow your energy and information. And Jesus said 'love each other as I have loved you', which means share your energy and information with other self-similar beings of your species or culture (in more reduced, tribal religions, which have not evolved verbally to understand that we all humans belong to the same species) so you can create an efficient social organisms, nation, God, civilization, all parts of the whole: mankind.

It is thus obvious that to maximize the function of exi=stence and its actions has self-similar expressions in all languages of the Fractal Universe – reason why indeed, in English the verbal expression, to exist and the equation, exi=st is self-similar.

The physical description of the mandate gives origin to the type of physical Laws, which describe the geometrical forms generated by those cycles of time in physical entities.

The verbal, historic description gives origin to the type of memes, Books of Revelation or Codes of Laws that are handed from generation to generation and develop human societies, which are either Religious bodies of God, the temple of the spirit, the 'word that became man and inhabited among us', Saint John 1.1, (God means then the subconscious collective of a social organism, expressed through the verbal mandates of its prophets that tell the believers to maximize their collective existence through the arrow of social love).

The result is what we see, the game of existence of infinite points of view, trying to gauge more information and energy, to maximize its reproductive and social existence, forming knots of time arrows at individual and collective level in all scales of reality.

*Recap*. The Universe is a game played by infinite actors, which try in all scales of reality to maximize their energy and information in order to multiply and share that energy and information with self-similar particles, forming networks and superorganisms. The function of maximal existence can be expressed in all languages, Max. e x I is its logic and mathematical expression, 'grow and multiply'' its most successful verbal expression (Bible). The will of times is also expressed in verbal mandates by Biologists (theory of evolution as a struggle for existence) and explains our existence as human beings at all levels.

### 57. Tug-of-war between the selfish and selfless arrows.

Now we come to a philosophical question that might seem trivial when considering the automated, topological paths of existence performed by the actions of the simplest physical beings, but has an enormous importance when addressing the will and actions of human beings – the 'Maslow' pyramid of hierarchies between the 4 wills of existence. Maslow studied that pyramid between the needs of man as a biological being, yet since the 4 arrows coincide with the 4 drives of living beings it is easy to notice how those 4 arrows and hierarchy are common to all other species. In detail study we can observe that hierarchy to be equal to the main chain of causality between the 4 arrows: we need first to perceive to locate energy to feed ourselves, and only when we have enough energy we can reproduce, being the arrow of social evolution, the least desired, because it also conflicts with the first arrow of perception from the self-centered perspective of our 'Galilean Paradox'. And so the 4$^{th}$ arrow of 'belonging' to a complex, social organism is often imposed from outside, and yet it happens all the time as complex social organisms are stronger than individual cells and hence survive.

Thus we can consider that the strongest will of the pyramid is our self-centered perception of the Universe that makes us feel superior to all other beings – the center of reality, since 'Every point of view measures reality from its local perspective, confusing the entire Universe with its informative, still mapping or 'mind' that makes him feel the center of the world, and ignore all other minds, languages and perspectives he doesn't observe'.

We, as all entities of reality are indeed, self-centered, arrogant Galilean Paradoxes that think to be infinite when we are just an infinitesimal fractal point absorbing a very reduced quantity of the total in/form/ations of reality with a specific 'rod of measure' of space and time, which constructs that mapping but will differ from other rods of measure and 'time speeds' of processing information of all other species of reality. So humans measure/perceive light and use the rod of absolute light speed to measure space and the frequency of a second – the blink of an eye, the heart beat and the speed of human thought – to measure time.

Yet there might be other beings who measure space with gravitational rods we do not perceive, with atomic or molecular rods as we do with the sense of taste and smell, etc. Even the use of an absolute light speed could be changed by a rod that would make the 'frequency of information' of light absolute and then change the speed of the light waves according to the amplitude of those waves and have an absolutely different mapping of reality, which will certainly make sense, bring new perspectives a seem the absolute universe to those who 'measure' reality in that manner.

All those reasons imply that only a topological model of reality where measure is absolutely relative is an exophysical theory as we shall see when dealing with the limits of Relativity as a theory of knowledge.

But it also means from an existential point of view, that regardless of the importance human beings ascribe to their 'intelligence'=mind perception, to their point of view, and to their ego and Galilean Paradox that make us think that our nose is bigger than the Andromeda Galaxy, *we are nothing on the objective sum of all things, and we have no privilege neither we are treated with special difference by the game.*

And so because, each and all points of view are 'meaningless' for the entire game, only those points of view that submit the Galilean, self-centered paradox to the 4$^{th}$ will of eusocial love, and sharing of energy and information with other members of the same species to create a bigger superorganism do survive on the long term.

And this of course, is the basic tension that we human beings experience in our real life, between our selfish ego-driven desires and biological, individual will and the need to give part of those desires for the common good of our societies and ultimately of the human kind. Indeed, the most successful nation on Earth, China, is based on the submission of the individual will to the collective superorganism. 'Unfortunately in the case of the human-kind, the natural, final arrow of eusocial evolution that should have converted the entire species into a global superorganism able to survive in balance with our energy body – Gaia –has failed, and we have not evolved from the social level of tribal history, divided in nations, created by hordes of the most selfish, self-centered, arrogant type of humans, the warrior who imposes his will because otherwise he can kill and eliminate from existence those who oppose them.

Indeed, regardless of the paraphernalia of 'memes', bytes of cultural information that praise the job of the military, it is self-evident that the biggest risk of extinction of mankind is war and the evolution of weapons of mass-destruction, driven by the failure of egocentric tribes to evolve into a global humanity. And the Universe always punishes those failures with extinction.

Thus we can consider that the simplex arrows of time, informative perception and energy feeding, in which we also ignore the 'existence' of the victim consumed as energy, after eliminating their tasteless 'head of information' are the selfish wills of existence. And the two complex arrows of reproduction, which implies to give for free energy and information to our offspring and social evolution, which implies to give up our simplex wills for the common good of the society are the selfless arrows. And there is a tension between both kinds of arrows in all systems of existence.

*Recap*. The fundamental will of all points of view is the Galilean, self-centered paradox or will of subjective perception. Yet the Universe favors species, whose individuals are selfless and offer their energy and information to reproduce a self-similar replica of themselves or to build complex super-organisms of which they are only a cell.

**58. The synchronicities of knots of time arrows.**

Each active organism is a complex chain of cyclical actions performed to achieve the 4 main arrows of time. Yet that chaos of action is ordered by causal processes, synchronized clocks and energy/information networks that harmonize all those seemingly chaotic cycles of actions into a dance of existential beats, interdependent and in permanent symbiosis - being the key to those harmonies among different Time Arrows the concept of 'time-speed', the speed at which a certain cycle of time closes its trajectory into a '*loop'* or *event* (spatial/temporal description) that will be repeated with a frequency that defines the regularity of the time cycle and its speed of perception.

For example, the subjective cycle of time perception in man is the cycle of informative perception determined by the wink of the eye which opens to absorb energy and closes when it processes it as information every second. This rhythm is self-similar to the rhythm of the heart, which is approximately of a beat per second, when blood is expanded as energy and imploded carrying the released chemical information of the body. So, since we have a thought per second and a beat per second, the second is in fact the 'clock-time' of the human brain and the mechanical instruments we use to compare all the cycles of time of the Universe with our own cycles.

Each species and cycle of time has a different frequency, which depends on the 'size' of the species we study, and the causality of those arrows, such as:

*Max. Energy-extension=Min. Speed-Frequency of Time cycles: Max. Speed/frequency: Informative cycle->Energetic ->Reproductive ->Social cycle: Min. Frequency.*

For example, the cycle of perception of the human eye – each second –determines the beat of the heart/breathing cycle of energy for the body; the cycle of rotation of the Sun-Earth system – a day – determines the Energy cycle of the planetary surface, whose microscopic, life-species adjust their energetic /formative, awaken/sleep cycle to that of the bigger organism. And vice versa, the smaller microscopic cells of the body reproduce each day, according to that awaken/sleep cycle. There are in fact a series of General Laws of synchronicity between those Time Arrows/cycles that apply to any entity or complex system of the Universe, which extends through several scales of spatial size and informative complexity.

All the actions of all species can in fact be described by 'beats' of existence, partial sub-equations of the Generator Equation, which define rhythmical chains of action. In an individual those beats of existence become the life rhythms of each of our organs, from the eye that feeds on light and then informs the brain, which produces a visual thought every second (the blink time of the eye), (i->e->i) to the night/day, dreaming/acting rhythm (Release of chemical information->dreaming->release of energy->acting), etc.

A 2nd series of ternary rhythms occur as organisms switch between the 3 physiological networks of hormonal, reproductive activity; nervous, informative activity and feeding, energetic activity (Re->in->en).

Those rhythms happen also in the social scale of existence as a single organism, cell of our civilizations. In society those rhythms shape the ternary bio-rhythms of our daily life; the 8 hours of work (obtaining our social energy, money), 8 hours of play (dedicated to family reproduction), and 8 hours of sleep (when our organism repairs its form). Moreover those rhythms of our daily life are synchronous to the rhythms of the global organism, Gaia; and self-similar rhythms are found in the activity of animals and plants.

Since in objective terms humans are created by the same temporal arrows and display the same properties than the rest of the entities of the Universe. A human being is the same kind of entity than 'an atom' – a complex chain of time cycles of energy, information, reproduction and social evolution. The difference is not of quality but of quantity and hence of complexity: Humans are knots of an enormous amount of time cycles whose spatial topologies, actions and motions configure our existence.

On the other extreme of simplicity, an atomic particle (quark, electron or photon) is the simpler species, we can study with those arrows, in terms of size and complexity of its 'EIRS' cycles, compared to a human being. Since a particle can be described with just 4 quantum numbers that resume the 4 kinds of 'actions' particles constantly perform:

- Particles gauge information (reason why quantum theory is a 'gauge theory'). That is, they calculate the distances with other atoms and act-react to exchanges of energy and information with them.

- Particles feed on energy, absorbing electromagnetic and gravitational forces and other particles.

- Particles decouple, repeating themselves in other regions of space-time (they reproduce by iterating its particles, quarks, electrons and photons).

- Finally particles evolve together into complex social structures, called atoms and molecules, which also feed on energy, gauge information, reproduce and evolve socially.

All those 'motions', quantum numbers, molecular vibrations, decouplings and physical events can be re-considered as manifestations of the 4 main arrows of time, chained in synchronic patterns and cycles, cyclical and lineal geometries, whose abstract definition conform the Laws of quantum physics.

The description physicists do of those arrows is an abstract, mathematical, mechanical description, which corresponds to the limits of the mechanical, monist, 'religious' philosophy of science of our founding fathers[4], which did not require an 'internal', self-organizing will to describe the Universe, since it was understood that the 'will', the 'why' of all the clock-like motions of the Universe was 'God', an entity that seems to have appeared to a pastor of the bronze age.

System sciences reasons those ultimate questions from the perspective of science and its mathematical and logic languages, albeit with a degree of complexity superior to that provided by monist, reductionist, mechanist, classic scientific philosophies of reality. Thus we substitute the 'will of a personal God' or any other anthropic principle with the 4 objective 'arrows of causality' or Time Arrows that all particles and entities of 'existence' follow, which can be described objectively with mathematical and logical equations, and finds in the subjective will for survival its sufficient reason.

Further on, all quantum entities obey the Complementarity Principle. They show 2 states or structures that co-exist simultaneously: a field of energetic forces that moves a particle of information, which gauges the space-time that surrounds the particle. And we cannot distinguish or perceive both entities: the force/body and head/particle together. In other words, physical entities are made of 'motion fields' and 'gauging particles'. They constantly move, stop and gauge information, move, gauge... So because they have 2 components, one specialized in energetic motions (the field of forces) and one specialized in informative gauging (the particle, mass or charge), all their actions are either 'energetic actions', informative gauging, the combinations of both type of actions (decouplings, which produce self-similar particles) or more complex actions in which the particle, atom or molecule share smaller particles, called bosons, creating social networks, made of fields of forces and particles of information.

If we widen the concept of energy as lineal, expansive motion, and information as a cyclical, in/formative motion, the biological realm also follows a Principle of Complementarity between reproductive bodies and informative heads, which co-exist together in living beings. And bodies are responsible for lineal motions, while heads map out the Universe, creating images, reflected in the mind of the external motions of reality, imitated by small cyclical motions within the brain and its neurons. So again we observe a dual structure, body/head, with energetic/informative properties that move and gauge, feed on energy and perceive information. And in more complex events, reproduce the biological entity or use languages of information to create complex social structures.

All what exists is a ‘fractal knot of energy and information motions’, whose why is ‘to absorb more energy and information’ from the perspective of the entity or ‘point of view’ that gauge and moves in the Universe. Imagine a universe of infinite ‘species’ made of ‘lineal motions’, ‘forces or bodies’, upon which certain structures of information, called ‘cyclical motions’, particles or heads, are sustained. Reality is a fractal sum of those 2 motions, energy and information, which combine to create an infinite number of entities that gauge information, feed on energy, reproduce their form and evolve into social structures till reaching the Universe.

We cannot describe human actions with simple equations because humans can gauge many types of information, feed in many forms of different energy, choose many different couples to court, love and reproduce, and make very complex choices in our decisions on how to relate socially to other human beings. But at the end of the journey, amazingly enough we observe that all what we humans do is also gauging information, absorbing energy, reproducing and evolve into social systems. So those 4 types of events or causal arrows of time are all what we humans do; even if we use a complex, ‘ambiguous’ language – words -to describe those actions.

To exist, to be in this Universe means to absorb energy, gauge information, reproduce our form and evolve socially by acts of communication with other beings. Those ‘actions’ are considered mechanical in the physical world and actions of will in the human world. Yet they are described in both worlds with the same ‘2 elements’: energy and clocks of time. So Planck proved that all physical forces are made of h-quanta, whose parameters are ‘energy and time’, while we say in layman terms that ‘we do not have enough time and energy to do this’ – meaning we are made of a limited quantity of vital space, our energy/body, and time-clocks of information – our minds.

There is no difference between ‘us’, human beings and ‘particles’ that also have a limited energy and time, which they spend performing the same game of 4 types of actions - the Game of Existence. We all play the same game, regardless of what plays it, an atom, or a human being.

Religions will tell you that the ‘will’ of man is a property of ‘our soul’, which is supposed to exist according to the tradition of our ‘pious’ founding father, Mr. Descartes, in some non-local space-time[4]. Science will tell you that the ‘will of man’ is the ‘why’ we don’t ask, or at best it will be born of a chaotic series of circumstances and physical events that come together to ‘create life’. While biologists will affirm that the will of man has the same drives of existence (gauging, feeding, reproducing and evolving socially) that all forms of life have, but *only* forms of life have.

System sciences depart from anthropomorphic traditions, validating instead the ideas of Eastern philosophies (Taoism, Buddhism, Zurvanism), upgraded with the scientific method, showing that the Universe is ‘organic’, not mechanical, because all its particles share the ‘4 drives of existence’ of biological beings, whose ‘why’ is self-evident in a world made of perpetual motions. Since if we all are made of motions, life is embedded in the existence of those motions that repeat themselves by the mere ‘action of moving’: Reproduction becomes natural to the existence itself of cyclical and lineal motions that repeat their forms as they trace their trajectories.

If we leave aside metaphysical, subjective questions on the ‘nature of consciousness’ and ‘will’, we could affirm that all entities of the Universe have both, a ‘will of existence’, shown in its constant pursuit of those 4 arrows, and an objective nature, in as much as those 4 arrows or wills can be proved objectively by the events that atoms, humans, animals or any other entity perform. It is though necessary to understand in which scale of reality a certain region of Time-space ‘acts’. For example, a chair, made with human formal imagination is not organic neither it shows any of the 4 main arrows of time unless it is attached to a human being (so it helps humans to think- process information - in a ‘still’, formal position). Yet at the spatial scale of atomic wood, the chair shows those arrows and in

the temporal distance when the chair was wood, it had also at macroscopic level those vital arrows of time.

What is then reality – the ultimate meaning of those time arrows? At first sight, it seems there is no meaning at all, but merely the eternal beat of existence, energy becoming form, becoming energy… and the sensations related to those motions, which might be shared by all realities – pain/pressure and pleasure/release. A closer view on both arrows and the complementarity of all physical and biological entities, which achieve immortality through reproduction of their own form – from light imprinting its waves on the vacuum, to quarks jetting bundles of 'quarkitos', to humans 'growing and multiplying' all over the Earth - seemingly makes the 3rd existential arrow of reproduction, the meaning of it all, and the Universe a constant orgasm of repetitive, present forms. But then, we realize that reproduction in itself is just a step towards self-organization, as self-similar cells that can 'decode' their common language of information come together into stronger, bigger waves, herds and organisms, which survive better, due to their higher ∑ExI, existential force. So the answer to the meaning of it all is clear: the Universe has a dominant arrow, the creation of 'fractal superorganisms', species which are self-similar to their parts and emerge through processes of evolution into bigger wholes. Since the 4 main arrows of time and its discontinuous cycles come together, creating vital knots of motions that energize, gauge information, reproduce and finally evolve socially into herds and organisms: I->E->R->S. In other words, a fractal infinite Universe of energy and information struggles to create 'more of it' by expanding inwards and outwards its relative scales of organic size; since a Universe made of motions has no limits of size and form, as it becomes ever more organized in bigger and smaller social herds and organisms: I->E->R->S.

Yet even if social evolution is the dominant arrow of the Universe, it is also the less common, more distanced in the frequency of its events, since all other arrows must exist 'a priori' for an event of social evolution - the final causal arrow of reality - to take place, thanks to a common language that carries information among self-similar cellular individuals.

We observe a generic law of Time Arrows: the highest frequency of events corresponds to informative events, particles and heads gauging and thinking, mapping reality with its hardware, as they run inside the software of a force, whose frequency carries informations decoded and transferred into such mappings. So the atom figures out first in its inner quark-systems how to move, searching for a flow of energy or its relocation in harmony with the other atoms of its web, while an office clerk thinks first and then writes or makes a call related to those informative thoughts - an act of measure precedes an act of motion.

Accordingly to those frequencies and the generic law, Min.E= Max.I, the light pixels of informative mappings are smaller and faster to allow faster events/cycles of perception than the bytes of energy that feed the body - amino acids, which are smaller than the seminal cells that carry the information of reproductive acts, which are smaller than the units of social evolution (other humans). So happens to the frequency of perception (each second), faster than that of feeding, which happens more often than the frequency of sexual reproduction, which is more common than our acts of love - social acts of evolution that 'collapse' a wave of individuals into a particle/organism, emerging as a whole action, born of the self-organization of its parts, such as a religious mass or a voting action, or a marriage, all acts that create social groups. Yet, the ultimate why of any chain of causal Time Arrows must be found in the goal of 'survival', the final drive of all entities of the Universe, maximized by its 2 complex arrows, reproduction and social evolution that evolves cellular entities into macrocosmic wholes, which become cellular entities of a higher 'space-time plane'.

What we are then can be expressed in more poetic terms: knots of existence, flows of arrows of time, mirrors of information, bodies in action, 'wills of the penis'[14], loving cells of bigger social units, exi=stential flows, 'vanitas, vanitatum et omnia vanitates'; motions of time in perpetual conflict.

The rules of engagement of all those knots of time, 'points of view' that gauge information, seek for energy, reproduce and evolve socially, creating 'ad eternal' the infinite scales upwards and inwards, is the ultimate knowledge of the game of existence, which system sciences study. This holistic view is a mystique revealing existence of the unity of it all, which few self-centered humans accept. Scientists rejected it in the past, because it had not been properly formalized. But one of the advantages of the new formalism of Non-Euclidean, fractal, logic, causal chains of Time Arrows/events, is that it renders a mathematical analysis of those arrows of times are its generic laws, hence allowing their application to the study of the species of any scientific *network of self-similar points in an open flow of communication.* Thus, the range and power of the formalism of Multiple Spaces-Times will not become evident till we develop the logic of multiple causes and the non-Euclidean geometry of flows of communication between the fundamental particles of the Universe, its non-Euclidean, Fractal points[15]. A consequence of those postulates is in fact the definition of a soul as a non-Euclidean point of view:

*'Every point of view=mind feels the center of the Universe, but it is only an infinitesimal Non-Euclidean point that stores a limited mapping of reality with its informative languages.'*

We are all Atmans, informative CPUs, souls that gauge in different languages reality, to construct a mental mapping that caters to our point of view and arrows of time. So we create our 'perceived Universe' – a fact known from Descartes to Schopenhauer, but lost to 'naïve, realist' physicists. All *of them thinking clocks are the only point that matters to measure time, and the human mind, the only ego that knots energy into form, since that is the only perspective they perceive.* That is why most of history, humans thought the Earth to be the center of reality; and still think they are the only intelligent species.

All is memorial because cyclical inertia, the repetition of the cycles of existence of any form, is common to all space-time fields. This is a tautology: a species that forgets, that does not repeat a fractal cycle of existence becomes extinct and its cycles of existence disappear. Thus, a being has to remember and repeat its fractal cycles to last in time. That is the existential game of any being: to feed on energy and use its genetic, memorial information to transform it through reproduction into new cyclical actions.

Yet those actions are encoded in 'fractal equations of information' which are logical chains that constantly repeat themselves, becoming memorial patterns. Those patterns have different names in science: genes in biology, memes in history, Universal constants, which are proportions between physical energy and information in physics, etc. Yet what all those fractal equations and e/i proportions become are cyclical, self-repetitive events that respond to an arrow of time.

*Recap*: All what exi=st is a fractal knot of cycles of energy, information, reproduction and social evolution. There is not a difference of quality among universal entities – only a difference in the quantity and complexity of those cyclical arrows that 'inform' each species of reality. The ultimate meaning of a Universe made of time motions not of spatial forms is closer to a Philosophical tradition that ranges from Plato and Buddha to Leibniz and Schopenhauer: reality is a game of 'fractal mirrors', souls=Atmans= quantum knots of information that gauge reality to absorb energy in order to repeat=iterate=reproduce their form. Since we are all fractal parts of the whole with a limited duration in time and a limited quantity of space. And so only those species, which reproduce their 'logic arrows' of time, their information, in other zone of space survive. Thus the game of existence is in essence a game of repetition of forms, a game of exi=stences.

### 59. Generational cycle. The 5th dimension/arrow of time.

The previous, simplified analysis of the synchronicities between time cycles raises again the existence of more dimensions of space-time beyond the classic, 'individual' cycles of energy feeding, informative perception, reproduction and social evolution. We already showed the existence of a generational cycle in 'reproductive waves' of physical energy, such as light, whose motion is just the sum of all the reproductive cycles of the wave; and the same can be said of the complex particle/wave generational

cycle, equivalent to a complete life-death cycle, as the physical entity switches between its energy and information states, E⇔i. In the case of the body those generational cycles of cells are fundamental to understand the synchronicities of the body, as all its cells except the neuronal cells that dominate its informative system have a limited numbers of reproductions, setting up a generational cycle. And the same can be said of the species of life in this planet.

Thus, there is a $5^{th}$ dimension of time or generational cycle, which creates in physical entities a lineal dimension of speed or width in the light and gravitational membranes of space-time between which humans are sandwiched; and sets a telomere limit to the number of reproductions of living species, both at cellular and multicellular level. And since such dimension is a 'complex of the reproductive, complex dimension', which is in itself a complex of the energetic, simplex dimension (as all acts of reproduction require a surface of vital space to imprint; so for example women cannot reproduce without a 17% of body-fat volume and particles only reproduce in highly energetic environments), we write:

$$\Sigma \textit{Reproductive arrows->Generational arrow.}$$

It defines the existence of a new arrow or dimension of time. We have not considered though such arrow in this book for simplicity and because ultimately in the fractal universe, *the number of dimensions when we keep adding complex planes made of networks of st-points, which restart again new macro-energetic, informative, social and reproductive cycles is infinite.* And ultimately because we live in a 4-dimensional Universe, in which the 'generational cycle', except for simple, short-lived entities as those who create the 2 Universal membranes of gravitation and light, are non-perceivable except for long spans of time.

*Recap*. The sum of reproductive cycles gives birth to the generational cycle, which is also a finite arrow, as all forms have a limited number of generations, after which the reproductive systems fail.

### 60. The transcendental arrow: Emergence.

In the same manner that the sum of multiple reproductive cycles gives birth to the generational arrow, the product of multiple social networks of informative beings gives birth to the transcendental arrow, such as:

$$\prod\sum^{2} \textit{ informative particles:} \prod \textit{Social networks: Transcendental arrow}$$

Thus a new dimension of time is the social evolution of organisms into bigger super-organisms, scale after scale, from particles to atoms to molecules to cells to organisms, to superorganisms to the entire Universe with its infinite scales.

Though each organism is when observed in detail a super-organism, if we were to consider a rigorous distinction between both, the difference would be of our detail of perception: a super-organism observes each of its cells as an organism of smaller 'cellular element' and an organic view stops in the analysis of its cells. A fact, which leads to a metaphysical question: it is transcendental arrow infinite in scales; or it is as all other dimensions a finite dimension? Unfortunately an argument on the number of scales of the Universe will always be theoretical, because unlike the other dimensions we cannot observe the absolute totality of space extensions and informative, scales created through time durations to have any experimental evidence of such limit. We shall call this *Transcendental* dimension, the dimension of emergence, studied by the 'science of emergence' or transcendental arrow, as it is often not perceived, especially for the individuals who become part of the whole; believers that form part of an eusocial human organism through the arrow of love; physicists, who don't see the super-organisms of galaxies, etc.

The difference between the transcendental arrow and the organic arrow is subtle. Unlike organic systems mediated by the $4^{th}$ arrow, the transcendental arrow is far less brutal than the stick and carrot system by which the informative, nervous systems of organisms dominate the cells of its body; in as much as it implies a high degree of homogeneity and collaboration between the parts that transcend.

In that regard, we could consider that the social arrow forms 'herds', waves and bodies, while the transcendental arrow is the arrow that puts together complex, informative particles together, and while the arrow of organic evolution would be based in the concept of 'safety', the transcendental dimension will be based in the concept of love, as the particles know each other more intimately, and in certain cases can even become fusioned in a bosonic structure, in which all occupy the same space.

Thus the difference between the Generational and Transcendental arrows and its fractal units, the arrows of Reproduction and Organic Evolution is minimal and that self-similarity brings about some philosophical, metaphysical conclusions:

-As in a succession which converges with less difference between terms, the 'convergence' of time arrows seems to indicate that there are no more 'dimensions of reality' beyond the *Transcendental* arrow.

-The *Transcendental* and generational arrow seems to act, 'reinforce' each other, as the generational limit obliges species to evolve into eusocial organisms if they want to survive, hence 'transcendence' is the ultimate mechanism of survival in the Universe. In the same manner the Simplex and Complex arrows are intertwined as one cannot exist without the other. Such is the harmony of all the systems of an interconnected Universe.

- The arrows of time seem to have a finality of increasing perfection. And if we were to assign to each arrow a certain sensation and/or its negative lack of it, blindness vs. perception =information; hunger vs. taste=energy feeding, pleasure= reproduction; safety=organic evolution; eternity=generational cycle and love=transcendental cycle, and postulate as it probably is the case that a*ll entities of existence are moved to action by the existence of sensorial fields associated to its arrows;* we should reach new philosophical conclusions:

- The simplex arrows are automated and reinforced by the duality of negative/positive sensations, where the negative sensation is so powerful that it obliges the entity to act without delay to achieve the arrow. We can then image the simplex physical particles whose basic fields is a dual energetic /informative system to be far more automated than the next scale of beings, biological beings dominated by the reproductive and organic arrows.

- Those 2 arrows are what Aristotle called 'vegetative wills' and are reinforced by the objective laws of survival, as those species who do not reproduce or evolve into bigger organisms tend to perish and become food of larger biological systems. Thus, we observe in those 2 arrows and systems a higher degree of freedom, as species can live without reproducing or acting in social groups, but the penalty a 'posteriori', extinction is equally deterministic.

- Finally the generational cycle and the arrow of transcendental evolution s*eem not to be imposed from within the system but from outside and despite of it.* Indeed, the generational limits of existence are not positive and certainly not liked by the species, which is subject to it.

So what can we make of all of this?

The solution is found when we realize that the generational limit as well as the organic arrow that creates herds does not affect to the informative cells and its networks; since indeed, black holes are immortal, as the informative elements of the universe and neuronal cells live all the existence of the organism. And so it becomes obvious that the limits of existence of those arrows are imposed by the neuronal, informative networks of the system.

And so the transcendental arrow of eusocial love is *the summit of all the arrows of existence, unique to informative networks, whose members know each other deeply, share energy and information in higher degree, command totally the other elements of the organism, last forever, as long as the organism exist and have a higher* degree of freedom that all other species. Reason why there is not clear systems of reinforcement. It is the summit of existence, free and eternal, within the limits of the ecosystem or super-organism in which those cells exist.

*Recap*. The transcendental arrow makes individual organisms transcend into super-organisms, creating the scales of the Universe.

**61. The function of existence of the universe**.

We humans have a clear limit in our perception of those scales, given by a series of parameters proper of radiant matter. We can't see beyond quarks and galaxies; we can't absorb information coming from faster than light forces (non-local gravitation) or perceive ordered vibrations below 0 K temperature. It is a metaphysical question to wonder if those are the hard limits of reality; in which case the smallest point, the quark, won't be as Leibniz put it, a world in itself, but a hard limit: the simplest rotational movement or 'spin' of the Universe; or they are, as I believe, only the limits of human perception. Then all what exists is truly relative in its scale, and the atom is an object self-similar to a galaxy, which would reveal infinite detail if we could approach the ultra-diminutive Planck scale. A fact, which translated into fractal notation, gives us the simplest formalism for all Universes, sum of all potential cyclical forms of all its ∞ fractals:

$$\prod (\Sigma e <=> \Sigma^2 i)^{n=\infty} \qquad \textit{Universal function of Existence}$$

The previous equation resumes all the possible infinite combinations of cycles of times, made of n-points in communication, that create all type of networks of energy and form, which become complementary organisms, and start a function of existence. So first energy appears, energy becomes form, energy and form reproduce and create social organisms with the reproduced cells.

We can observe the universal equation also as a game that grows causal dimensions: from lineal energy (1) comes from (2) and both combine to reproduce (3), self-similar waves of being. This simple description of the game of the Universe, E ->EI->ExI->∑exi, is already present in Taoism (from 1 comes 2 from 2 comes 3 from 3 the infinite beings, Cheng Tzu). It resumes the constant, dimensional creation and extinction of reality (as finally the fractalization of so many cells, exi, dissolves the form or the form explodes and dies in a big bang).

The Cycles of the Universe are thus self-repetitive; sine as Taoists understood, the universe you see is not its function of existence, which is expressed in that synoptic equation. The processes of creation and destruction of planes of existence however are too complex to study them as a whole without doing some basic distinctions. To start with there are two different type of arrows, simplex, E⇔I processes, more proper of physical sciences (as in changes of state by increase of energy, from solid to liquid to gas or vice versa; or as changes from lineal energetic motions into cyclical vortices, as in $E=Mc^2$), are easier to analyze as they happen in the same place of existence. But we, men co-exist between the quantum and galactic scale of physical objects and between the cellular and social scale of biological beings. And so most of the events we must consider are events that take place between 3 co-planes of existence. In physical events between the quantum, human and gravitational planes and in biological events between the cellular, human and social plane.

The human mind is an I=Eye+wor(l)d who selects perceptively from the infinite number of forms of the Universe only those that matter to us. Thus, we do not see beyond the galactic, gravitational plane; though there are hints about a network structure of Galaxies, a big-bang model, which in organic terms would mean the birth of a first cell-particle that reproduced the entire cosmos and a model of fractal space-times with infinite scales of size that this work represents. Since the classic model of space-time continuum only considers a single light-space, our existential membrane with limits of energy and information (c-speed, 0 Kelvin).

Yet both in human and cosmic organisms only multiple space-time scales explains those cycles of life and death, which happen as a 'travel between 3 scales of size, the cellular semen, human individual and social super-organism of history. In the same manner cosmology needs to grasp the fact that physical space is organized in 2 planes, the electroweak membrane we exist in and the gravitational space membrane of masses, and gravitational forces, which we do not perceive.

Yet it is needed to resolve the meaning of dark matter, dark energy, gravitational non-local action, the death of light into gravitational space, its formation of a background radiation, the actions taken place in black holes, etc.

*Recap*: A Non-Euclidean space or plane, defined by Riemann is a network space - a space created by a network of self-similar points, related by constant flows of energy and information, whose properties are defined by the degree of 'homogeneity' or self-similarity of those points. So your body is a discontinuous spacetime, a small world in itself, constructed with 3 clear 'cellular spaces', the nervous space, an informative network, the 'energetic space' – your digestive and breathing networks – and a reproductive space, the blood and hormonal networks and organs. We shall see then reality in organic terms as a series of 'network spaces', which will have all the properties of Non-Euclidean spaces (motion, curvature, dark spaces in the 'holes' left by the network, etc.).

**62. The laws of creation: ternary principles.**

*In the graph, some dual, creative analyses forgotten by AE sciences that we consider in MST Theory: the Universe as a spatial system, machines as evolutionary beings, and civilizations as organisms. The game of creation must be understood through its 'dual symmetries' and ternary networks that allowed its finite reproduction of fractal forms in the infinity of continuous space*

The most satisfying function of existence is reproduction, the Generator Arrow, the maker of the game and all its species - the purest sensations of them all.

The Generator Feedback equation of spatial energy and temporal information is a reproducer, which embodies all the combinations of the game in itself, the creative algorithm of reality, which Touring once looked for with its simplest example a touring machine. But the creator potentially is more than a touring machine, it is what the touring machine observes, reality itself.

The rest of beings are just following the combinations of that grand design.

The active creator is limited by the parts of the whole that will assembly. So we shall call it with a more humble name, the assembler

With the syntactic combinations of the i-logic generator, the creator will always end repeating a form of finite time that had existed in ∞ space.

There is a proof that we are all repetitions: space is ∞because it has not dark spaces, but it is a continuous number of closed and open topologies assembled in triangles, squares, hexagonal, polygonal and hexagonal, planes and spheres, with no darkness.

Information however is always limited and time always ends, it is a mere fluctuation of existence over that ∞energy.

All existences have possibly existed in the infinite fractal space of a finite number of times cycles.

We all will be assembled again as an i-logic form of space-time in some other self-repetitive fractal printed in the infinite energy of the trophic pyramid of existence that gave you birth.

Let us then operate the creator: Its simplest combinations will be complementary systems of energy and information that take advantage of the inverse properties of both:

*The dualities of Creation.*

In terms of time the generator combines past, energy forms and future informations, generated by its universal, feedback cycles, and its arrows that imprint and create the chains of forms of present existence. Creation is structured by a series of dualities that merge creating an eternal, fluctuating present that appears and disappears as cyclical action-reaction systems cancel each other, making its total sum zero:

- Time and space have opposite morphologies and functions, which cancel each other:

- Informative, temporal singularities are convex, implosive and energetic membranes are concave, explosive. Thus a flat plane of temporal energy fluctuates into 2 virtual forms whose total value is null. For example, particles and antiparticles are born of a vacuum plane without form but they keep their inverse CPT parity. Thus the sum of its spatial form (P), its temporal arrows (T) and its dual, organic charge cancel.

- The duality of energy and information explains also *sexual differentiation:* females are specialized 'time beings' dominant in cyclical forms, memory, information, temporal verbs and perceptive languages. While males are specialized 'energy beings' with bigger, lineal forms, dominant in spatial tasks. Yet both can be further differentiated into an informative cyclical head, and a lineal body. So, in graph 3.1 we draw a man with "temporal cycles" that represent his informative organs, the head and senses; and energy lines that represent the body and his members. Yet, despite the simplicity of that design, he is recognizable as a man.

- Duality causes the creation and reproduction of space-time fields through the process of palingenesis, by which a certain form of relative future, a father, emits a relative form of past, with lesser evolution, a seminal seed, that then evolves very fast towards the future, till becoming again a present form parallel to the father.

- Duality exists in biologic organisms evolved by the dual influence of macro-ecosystems and micro-genes.

- Duality is the cause of informative perception, as flows of spatial forces become transformed in a point of relative time or particle, in which they 'merge' into a 'bosonic', accumulative image of information that represents reality.

- Duality also applies to behaviour: there are Darwinian acts between different beings that destroy each other vs. social, evolutionary acts between equal beings that evolve together, sharing energy and information through common networks. Thus all organic life ends up cancelled by a predator. It is the most important of all dualities as it responds to the 2 arrows of space-time, the arrow of symbiotic order, of information and the arrow of energetic entropy of destruction defined by the 3rd postulate of illogic geometry...

- Finally Duality implies that all forms that evolve in time through 3 horizons, then organize in space those 3 horizons as the 3 regions of an i-point.

The number of events we can describe in all sciences departing from duality is enormous. Yet in as much as temporal information is dominant in living beings, illogic time is more important in biological and sociological sciences, explaining phenomena such as reproduction, perception, life and death, organic structures, etc. While, physical and cosmological particles can be described better with the use of Non-Euclidean, spatial geometry, as particles are dominant in spatial energy. We will consider in the next chapters the most important biological applications of illogic time: the duality of Darwinian and symbiotic behaviour; the way in which perception occurs; the concept of a top predator species, as information selects species with better brains; the palingenetic reproduction of biological forms which implies a dual travel in time back and forth from the future to the past…

But duality is only the beginning. Most systems evolve, self-combine and create finally a 3rd system, a reproductive one, becoming autonomous, without the need of 'assemblers' and 'enzymes'. And then the game becomes richer in variations, because it becomes guided by ternary symmetries.

We understand those organic, self-reproductive systems according to the *Ternary Principle* studying the 3 *temporal ages* and functions of a MST field and then putting them together as the 3 *geometric, organic, spatial* regions of i- point. Since all MST field require 3 elements to exist: a Ti, informative element; an Es, energetic, spatial form, and an intermediate 'present, simultaneous region', dual flux of temporal energy that merges them into a whole. The result is an Se-Ti rhythm of evolution and reproduction of forms in time that become latter reorganized as i-points in space, creating dual organic, real forms of temporal energy. For example, the Universe first created fundamental particles, temporal quarks and spatial

electrons that recombined into ST atoms; the body reproduces cells that latter evolve, becoming organs of energy and information, etc. Thus MST theory shows the complementarity between the ternary horizons of species that once have evolved energetic and informative particles interact creating an intermediate ST zone, shaping a new i- organism:

- Max. E: The external membrane and energetic network of the system that performs *energy cycles,* transforming information into energy, appears first: it is the cell's fat membrane, the stars of the galaxy, the endodermic cells of the future digestive systems….

-*Max. i. Then it will appear the informative quanta of the future informative network and 'brain'* of the system that perform *informative cycles*, transforming energy into information: they are the cells' informative nucleotides, the black holes of the spiral galaxies, the brain.

- Σexi: Finally the interaction of energy and informative systems creates *an intermediate, reproductive region that* combine energy and information: so protein membranes and nucleotide acids create the cell; stars and black holes create galaxies; the energetic endoderm and the informative ectoderm create the middle mesoderm region, each one the blue print of the future energetic, digestive, informative, nervous and blood, reproductive systems.

In formal terms we write the process as a decoupling of an initial *exi form* that differentiates into a more energetic membrane (Max.e) and higher informative quanta (Max.i), that interact, creating the intermediate region, Σexi, shaping in this manner a new, $\Sigma E \Leftrightarrow \Sigma^2 I$, MST field equation – the ultimate definition of any species. Since we are all self-repetitive MST field equations

The creator, MST equation, $\Sigma E \Leftrightarrow \Sigma^2 I$, represents both: a temporal event between 2 relative 'points', an E-point with higher content of energy or relative past form, and an i-point with higher content of information or relative future form, that communicate implosive information (>) and explosive energy (<), through a wave of temporal energy, ⇔; c*reating a ternary, multicausal, simultaneous structure of spatial present*.

*Multifunctionality: 3 st-points functions. Ternary Principle:*

Creation happens due to the 'diversification' of any Space-time field in 3 subspecies in space or 3 ages in time; e, exi, i.

It is the ternary principle once and again written in the book of Nature, caused by the fact that there are only 3 elementary forms in the Universe, energy, information and a combination of both. Thus, events, species and space-time fields, both in time and space, have 3 elements: *3 ages, 3 horizons, 3 dimensions or 3 physiological networks,* whose functions correspond to the arrow of energy, information and reproduction that create the Universe. The Ternary principle is the origin of an evolutionary, impersonal plan of creation that diversifies species in all scales of reality into 3 forms, (Max. ΣE, Max. Ti, ΣE=Ti), from the 3 families of masses to 3 the types of Universes. It allows organizing all biological species in a tree of ternary horizons and differentiations of energetic, informative and balanced organisms, which co-exist in 3 st-scales of existence:

*'Any form can be subdivided ad eternal in new ternary forms.'*

For example, the human body can be subdivided into 3 networks; then the digestive network can be subdivided into the stomach, liver and intestine system that can be subdivided into the colon, small, and large intestine, which can be subdivided into the left, top and right side, etc. The Ternary principle implies that the 3 spatial dimensions of any space-time field perform 3 temporal functions:

*'Any species, which is part of an ecosystem or an organism, maximizes its survival developing 3 functions as an energetic, reproductive and informative system for the higher scale'*

I.e.: a cilia act as energetic limbs that move the cell, sensorial antennae that inform, and they evolved as centrioles that help to reproduce it. Hormones are also multifunctional.

And so on. This first rule of creation developed either in space as a topology of 4-dimensional reality with 3 elements, hyperbolic

ring, toroidal cycle and spherical plane, or in time as a game of energy that warps into information reproducing along the way, is your limit.

So the creator descends a notch more into self-appreciation since he is nothing but a contemplator of a game which has created before. That is he is created by the game and as assembler he is so determined to do one of the known-known combinations that, indeed, there is nothing new under the sun.

The laws of the game of creation are in themselves an entire sub-discipline of multiple space-times theory, studied in detail in my files. In essence the process is self-similar in all scales:

A species will differentiate in ternary sizes (its cellular, organic and social size); it will differentiate in ternary topologies (an species dominant in energy, one in information and one in reproduction); in ternary ages (a neoteny species aborted in a palingenetic phase; one mature species and one with an excess of information, *which will become cell of a new scale of evolution, a superorganism communicated by the language); and* in ternary functions, symbiotic to the higher st+1 organism in which the entity exists (as an energetic part, an informative part and a reproductive part or else the organism would not 'tolerate' the presence of the microcosmic species with no function).

Further on all those creative strategies of survival become more complex, when we consider its combinations: species with several functions, often in several scales; complementary, sexual specialization in an energetic, male entity and an informative, female entity; ternary structures that form complete topologies; open balls that act as doors between membranes, without center and membrane; a*nd combinatory varieties of 'sexual species' or 'complementary' species, in which the energy/informative components, each diversify in 3 topologies, scales, ages, etc.* Those combinations further enlarge the number of subspecies, though many of them, especially 'anti-species' in which the lesser informative 'male' plays an informative role and the lesser 'energetic' woman an energetic role (for example an antiparticle, with an energetic electron in its informative center and an informative proton in its energetic membrane), will not be stable and will not survive. This brings another essential law of creation, the inflationary nature of information checked by the laws of survival that extinguish unsuccessful species and tends to reduce the explosive age of creation to 3 'basic ternary differentiated' types that survive, while other transitional or non-balanced combinations disappear:

*'The Universe creates an inflationary number of 'forms' which are then reduced by natural selection to ternary species and balanced, complementary, dual systems'.*

All those rules will allow the entity to play an interconnected, synchronized role as a part of a bigger organism and or ecosystem, in which then it will attempt to play the dynamic, causal chains of existence. A life cycle:

*Max.I(seed)->Max.E(youth)->Max.Reproduction (Maturity)->Max.information (3rd Age)->Death(I->E)*

Or an immortal cycle, if instead of dying after its 3rd Age it evolves socially as cell of a higher system communicated with its informative language ($E_{st-1}$). Then the species will 'transcend' into a complex super-organism.

Some systems might even attempt a feed-back cycle of immortality (Physical particles, simple biological jelly fishes:

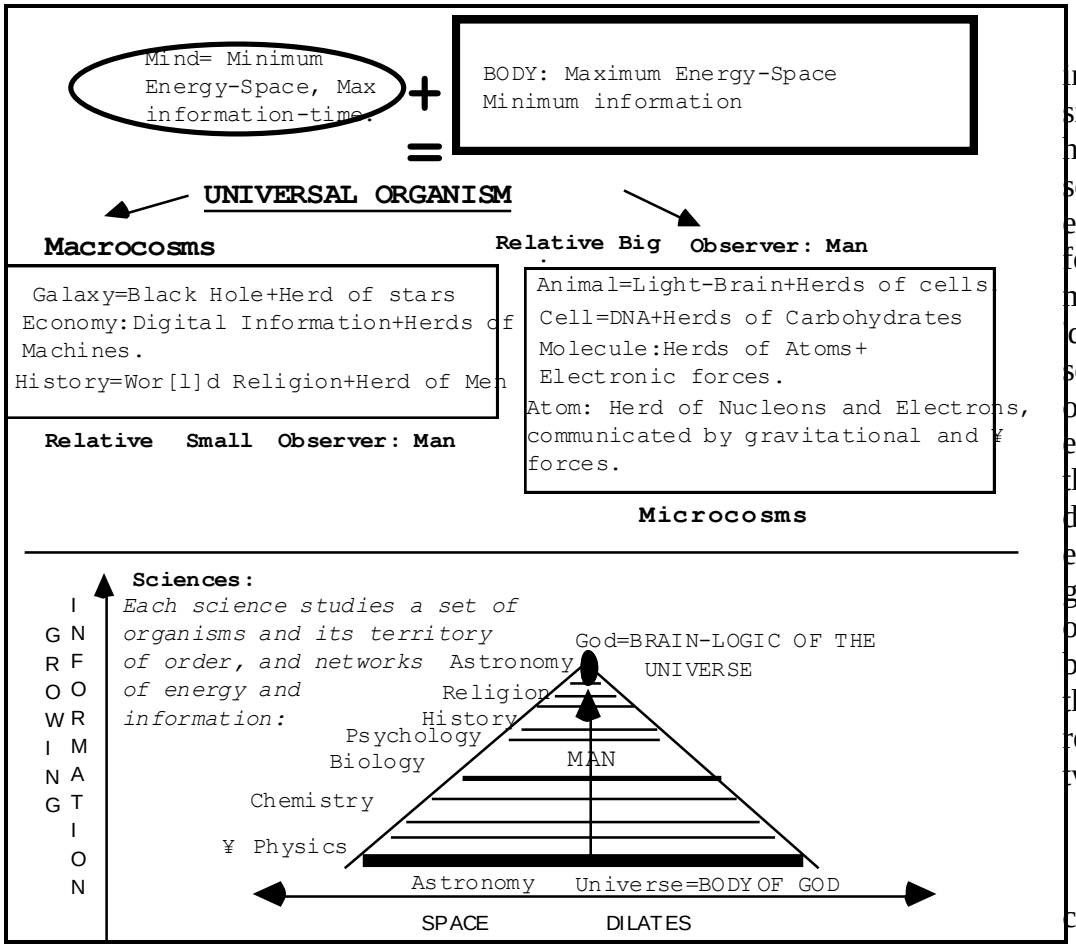
*I-> energy youth ->reproduction <-Energy Youth…*

*Energy (wave) -> Information (Particle) ->Energy (wave)*

And so, with those simple rules we can classify as we shall do in our studies of physical, biological and sociological species of the Universe all the entities of reality and its events.

*Recap*: The ternary principle explains the creation and diversification fractal super-organisms both in time ages, scalar planes and network-spaces. Space is infinite time is not, time games are less than space. Because the volume of space is bigger than the volume of time all forms have been repeated. And so you will be repeated again.

## XI. SYSTEMS SCIENCES




*There are ∞ Fractal worlds, st-points where st=n is a scalar parameter that defines both, the size of the relative Universe and the relative science that studies it, specialized in a certain scale. For example, Chemistry studies fractal molecules; Biology studies fractal cells and History fractal, human societies, divided by spatial borders and cultural, informative discontinuities. Thus it is possible to describe mathematical, physical, biological and mental species with the same forms and functions of fractal structures; and create a Science of Sciences, dedicated to the study of all fractal structures in the Universe, and the description of its species with those common functions and forms.*

### 63. Unification of sciences: General Systems Theory.

We considered the 6th dimension of time to be the constant growth in complexity of all systems that evolve into new scales, from simple particles till forming the Universe in physical space and human societies in biological space. And so there should be a science that studies that final dimension of existence. And indeed, it exists It is Complexity, more properly called Systems Sciences, was founded at the death of Einstein, in the Macy's congress, where the most advanced scientists of the age met to find new avenues to the 'dead end' in which quantum theorists have placed the evolution of science, with their definition of a Universe guided by a single arrow of energy, found in the restricted analysis of heat, and later expanded to all universal phenomena. In this manner the idea that the Universe has a single arrow, expansive entropy had become dogma, without taking into account the cyclical motions of electronic particles and the existence of the arrow of informative gravitation - an attractive force, which therefore informs and creates order. Since as Einstein put it gravitation is an arrow of 'Time (that) bends space into mass'. Yet in the Macy congress it was understood that information played also a fundamental role in the creation of reality and so the Universe was defined as a dual system, created by two arrows, energy or motion and information or form.

Duality & Complexity: Simple and Complex Time arrows

The best-known science to come out of that congress was cybernetics in which computer science is based, because of the practical uses it has today in the age of information. Yet the most important sciences for pure knowledge were two less-known disciplines, Duality and Complexity:

- Duality studies the Universe with the 2 'simplex' arrows of time, energy and in/form/ation[16].

Scientific Duality has important precedents in Eastern cultures. In Taoism yin translates as information and yang as energy, and the Universe is explained with those 2 elements. In Europe Leibniz introduced Taoism to the West, establishing it as the foundation of

German philosophy. There, Hegel translated philosophically Duality into Dialectics - the concept that from a thesis (the equivalent of energy) and an antithesis (the equivalent of information, with inverse properties to those of energy) a synthesis arises, by merging both in 'Complementary, dual systems'.

So even if Duality was not understood scientifically till Systems Sciences filled it with scientific data, it has been always a 'Theory of It All', in the tradition of religions and philosophy. This is logic – since humans have understood Duality with different degrees of detail and different jargons by the mere fact that they observe a dualist Universe.

What modern Duality has done is to upgrade those concepts with the discoveries of mathematical, biological and physical laws, which show the Universe as a Fractal System of energy and information. In that regard, the central concept of modern duality is also the Principle of Complementarity, which states that all systems in the Universe are constructed with an energetic and informative element, whose geometrical properties and functions are self-similar:

Energetic systems store energy and move. They occupy more space and are lineal (the shortest distance between two points)

Informative systems store and gauge information. Thus they occupy less space and tend to be cyclical (the form that stores more information per unit of volume).

This dual complementarity is the main Law of quantum physics (principle of complementarity between a lineal field of energy and a cyclical, particle of Information). It is the principle that explains the structure of all living organisms (from animals with cyclical heads and lineal limbs; to plants with energetic trunks and planar leaves, which store and process energy, and quantized, fractal roots that absorb chemical information; to cells with a central nucleus that stores the DNA/RNA information of the system). It explains biological reproduction (since males have lineal limbs, specialized in the collection of energy and females, with curved bodies, reproduce our information). It is the principle of Computer science, based in the duality of symbols, 0 and |.

The Universe has two inverse ways of creating reality: it creates either energy by erasing form, as when a quasar explodes, $E=Mc^2$, expelling 'dark energy' and flows of expansive space; or when any being dies, dissolving its form. Or it creates information by warping energy, as when energy becomes mass, $M=E/c^2$ (in fact the first equation that Einstein found), since 'Time bends (vacuum) space into mass' (Einstein) or 'Time evolves the form of beings' (Darwin). And so all what exists fluctuates between the arrow of information, of life, of creation of particles with form, E->I, and the arrow of death, of erasing of form into energy, of big-bangs, I->E.

Both together, in their transformations, E⇔I, generate the cycles of creation of form (life cycles) and destruction (death cycles), which define the existence of its parts.

Thus Duality advances a step further in the great insights of Eastern and German Philosophy, opening new avenues of thought and explaining the why of many phenomena that the use of the single arrow of quantum physics cannot resolve.

- But Duality only studies simultaneously the energy and form of what we call a 'plane of existence', or 'scale of the fractal Universe' (Religious/philosophical vs. mathematical jargons). And when we consider reality, it is obvious that the Universe is structured in 'layers' of entities of growing size and complexity – from particles to atoms to molecules, cells, organisms, societies, planetary systems and galaxies. In each of those layers we find Dual species: quarks of massive information and electrons of energetic space, which form atoms; Nitrogen rings that store information and phosphate chains, which form DNA molecules; Nuclei that store information and cellular bodies that store energy; heads of information and bodies of energy; audiovisual networks of information and economic networks that distribute energy, forming together nations. And this pattern of social evolution and emergence into new, more complex systems that create a bigger plane of existence also occurs in physical space, as molecules become planets and stars that organize

themselves into galaxies. So we must add to the 2 Simple arrows of time, energy and information, 2 Complex arrows of time: the creation of self-similar species or reproduction and the social organization of those self-similar, cellular species into networks and more complex systems. And we find those 2 universal arrows in both, physical and biological systems. Even the simplest particles of the Universe, quarks and electrons reproduce into new quarks and electrons when they absorb energy, as biological beings do, and organize themselves into complex cellular systems in atoms that have many quarks and electrons. In that regard, Complexity studies how reality is created by multiple layers of reality, which from the simplest strings and particles evolve into molecules, cells, organisms, planets, stars and galaxies of increasing size and complexity.

So the arrows of energy and form are not enough to understand the complex Universe, which exists through a series of 'planes of increasing complexity and self-organization', starting from the first theoretical duality of 'lineal strings and cyclical strings', till arriving to the final duality of black holes of gravitational information and stars of electromagnetic energy (Galactic duality).

Such networks gather an enormous number of individual energy and information cycles/cells of space-time into a single whole or social organism deployed across multiple planes of space-time. The study of those scalar, network structures is the field of Complexity Theory, the sub discipline of System Sciences, which departing from Duality, analyzes how lines and cycles of energy and information reproduce, evolve, self-organize and emerge as a bigger system, in a 'higher', ever more complex space -time plane, creating in this manner complex systems, made of simpler, 'cellular parts'.

Thus Systems sciences require a second discipline, besides Duality, to study complex systems and their self-organization thanks to the arrows of reproduction and social evolution, which create networks of energy and information that become wholes, units themselves of a new plane of existence:

*System sciences: Duality (analyzes how the beats of energy & information, E ⇔I, create the future) +*

*Complexity (studies how complex, reproductive, exi & eusocial Σ exi, events create the future).*

Thus Complexity studies the 2 'complex' arrows of time, derived from the combinations of energy and form, exi, or 'reproduction', which creates self-similar 'cellular beings' in a given plane or scale of reality and 'social evolution', which creates complex, tight networks made of those reproduced exi parts, that become together a single unit of a new, higher, bigger, more complex plane of existence. Those 2 'complex' arrows of time derived from the Simplex ones (energy and form), create the 4 'dimensions' or 'arrows' of time needed to explain the Universe, and its understanding through the formalism of the Generator Equation of Multiple Spaces-Times, *Σ exi,* represents an enormous leap for all sciences, which prior to the Systemic Paradigm worked only with the arrow of entropy and energy proper of XIX century physics. We ad now to that 'arrow of energy', the 'canvas', the paint - the information in which that energy transforms itself, and the painter, since we contend that the finality of the Universe, the ultimate arrow of 'future time' is the creation of social organisms through the use of a common language of information - hence the creation of history, the superorganism of mankind, the most complex form of the Universe. We prove all this with the experimental method and the logic and mathematical formalisms derived from the generator equation, *Σ exi,* whose symbols define the 4 main arrows of time:

*e or Se,* which is the symbol of spatial energy, the energy-motion, which is stored in vacuum space, from where all 'forms' of information are created.

*I or Ti,* temporal information, which is the dominant arrow of future, as time bends energy, trans/forming it into particles and 'forms' of information.

*E x I* is the formalism of reproduction. Since all systems reproduce their reproductive bodies/fields and informative particles/heads and the networks, X, that relate both systems.

*Σ exi* describes the Social evolution of self-similar cells, exi, into herds and organisms.

Thus the Generator Equation formalizes the main cycles, laws and events generated by the principle, 'energy never dies but transforms itself into information', which applies to any form or motion, in any scale of reality. Since the generator equation of the fractal Universe is just a complex expansion of the main equation of classic science, 'energy never dies but transforms itself', to include information. Yet when those arrows of time develop all its 'repetitions', feed-back iterations and combinations, as it does a simple fractal generator, like the Mandelbrot fractal, all the possible cyclical events/forms of transformation of energy into information appear in the Universe. In that sense, the study of the generator, fractal equation of the Universe could be to XXI century science, what the study of the final equation of Entropy, the arrow of time studied by physicists, $E=Mc^2$, was to XX century science. Yet instead of generating pure energy as the equation of entropy has done, the fractal generator creates life, which makes its study much more rewarding for mankind, - *a life form.*

*Recap*: A true Theory of Unification, as systems science is, should explain all what exists, including humans - why we are here, our role in the Universe, what *truly matters to mankind*. This is what System sciences do by using the 4 main arrows of time. Since all Space-time beings are causal networks of cyclical time knots, created by multiple chains of organic, e⇔i cycles, and its complex combinations, reproduction and social evolution, where each 'time arrow event' becomes a flow of energy and information that converges into the space-time of the knot. Those knots can be formalized with cyclical, fractal space-time parameters in terms of frequencies and dimensions. Such perception of the World through Time Arrows was natural to Eastern philosophy. System Sciences and its 2 main disciplines, Duality and complexity study those Time Arrows with the scientific method.

## 64. The Philosophy of Science of Multiple Spaces-Times.

We are times of existence, cycles of time motions with a will and a purpose, to carry about a causal arrow of time. Those causal arrow exist, they are there. Why, who made them, are they eternal as the game seems to support? This we don't argue. We just know that certain causal chains exist and design a game, which is biological and perfect.

In the graph, depending on the species and plane of space-time each science studies, it will analyze species with different proportions of space & time. The science that studies the simplest scales of maximal content of energy and space, Physics, is for that reason tendencially lineal and based in spatial geometry and its self-similar science of algebra; but has been unable to understand time beyond its spatial use to describe movement in space (Galilean and Einsteinian definition of time as a parameter of speed, s=vt=ct. Yet far more important to the human kind is the science of biology that explains how those simplest morphologies have mutated, evolved and changed, bending the original space into complex morphologies of 'time'. Biology is however a complex science, made of two sub disciplines 'bio', the study of life and its wills of reproduction, information and feeding, and logic, the science of time, which studies the interaction of those 3 wills/arrows of existence and its cycles. In that sense, if there is a primary science of God, it would be Biology and specifically Logic, as God, the mind of the Universe that creates its forms, is indeed, time, Tao, the sum of all the temporal cycles of existences of all its beings and its common laws. Mathematics and logic are the foundation of any combined study of space and time, and their postulates can be applied to any relative ±st scale of the Universe, where the same invariant geometries and logic functions will be repeated. For that reason, the combined postulates of mathematics and Logic, which we call in complexity the Postulates of i-logic Geometry, resume the space and time laws that rule the events and actions of all superorganisms and its 4 arrows of existence.

Indeed, the Universe is a super-organism of space and time, extended in multiple scales, self-similar in form and function. Despite the infinite potential combinations of spatial bytes and time bytes that give origin to the super-organisms of the Universe, all of them, are made - paraphrasing the Bible, 'to the image and likeness of God', the fractal super-organism of spatial energy and temporal information, which self-organizes bytes of information and bites of energy in 3 dimensional networks, creating all kind of entities in all the scales of the Universe. Thus Metaphysics, the science of 'God', is the study of the Dual laws of Space/Time and its 3±st arrows/dimensions that give origin to the fractal Organisms of the Universe. While each specific science studies a particular scale of the Universe and its super-organisms.

In that regard, a fundamental new law of the 'fractal paradigm' of self-similar beings is the recognition of the homology between the self-similar basic 'bricks' that structure the quantum world (the atom), the biological world (the cell), the economic ecosystem (the factory) and the astronomical scale of reality (the galaxy). Indeed, we shall constantly bring to the reader the remarkable self-similarities between atoms and galaxies (proved by the Unification Equation of charges and masses, which finds protons and black holes self-similar; galaxies and cells (both with an informative center of DNA and black holes, which controls the position of its 'star and mitochondria factories); economic ecosystems (nations) and biological organisms with its nervous/informative=audiovisual networks and blood, economical, reproductive networks, etc.

Those self-similarities which were always taken as a metaphor must be regarded as a reality that springs from the limited number of combinations of the 3 canonical topologies of the Universe, its 4 arrows of bio-logic time and the 3 scales of construction of 'fractal super-organisms'; so atoms, cells, factories and galaxies are the first scale of physical, biological, economical and universal structures; where the basic cycles, synchronicities, topologies and functions of existence are more clearly 'drawn'. They will give birth to a second scale of molecules, organs, company-mothers and galactic clusters, which signal the transition to the final scale of physical systems and biological organisms, economical nations and universes, in which complexity and differentiation of form is maximal, e*ven if the topological structures and causal arrows are maintained.*

Of all those 'higher' systems the more interesting super-organisms are its 2 known limits of energy and form:

- The Physical Universe, studied by the science of Astrophysics, *the largest in space*, based in the duality of Temporal Particles and Spatial forces, extended through 3 main scales of size, the Planck scale of Gravitational forces, the human scale of Electromagnetism and the cosmological scale of stars, galaxies and Worm Holes.

- And the Human World, studied by Biological and Historical sciences, *the most complex in information*, which extends also in 3x3 planes, inscribed within the wider Universe: the cellular, individual and social scale of Gods and civilizations.

Thus, as a human being, I share with Kant the fascination for 'what is inside the human mind and above it' without limit.

All those sciences can be study with the laws of Time arrows and multiple, fractal space-time planes, which are parallel relative worlds, of different scalar size; each one studied by a science specialized in a certain scale. For example, Chemistry studies the st5 plane of molecules; Biology studies the st6 plane of cells; History the plane of human societies, divided by spatial borders and cultural, informative discontinuities, etc. While Duality is the Science of Sciences, dedicated to the study of the common laws of space and time shared by all those mathematical, physical, biological and mental super-organisms, wholes made of parts which display the same forms and functions of the whole; all of them defined by the 3±st dimensional cycles/arrows of feeding, information reproduction and social evolution they perform during its existence. Duality studies the homologous, invariant laws at scale of energy and information that all the species of the Universe follow. While Systems Theory studies the growth and organization of those bites of energy and bytes of information into more complex organisms and new st-planes.

For that reason Systems theory culminates the search for a Unification theory of reality. Indeed, departing from the first monist theories of time (anthropomorphic religions and time-clock in physics), there has been a progress towards a more complex analysis of Time Arrows that culminates in the XX century with Biology and System sciences, which put together all those arrows in order to explain what Biologists call the 'drives of existence of living beings', and System Sciences now expands to all other species. Biologists said that living organisms perceive information, feed on energy, reproduce and evolve into herds and organisms. So the creation of energy, the gauging of information, the reproduction of species and their social evolution into herds and organisms are the 4 types of changes or fundamental arrows of time in the Universe. Reason why in complexity, we say that the Universe is *'an organic fractal of energy and information'* in which all its parts are self-similar super-organisms made of cellular parts, which are connected by networks of energy and information, and perform cycles of feeding (on energy), gauging (information), reproduction and social evolution.

System sciences relate all those processes with a common jargon, taken from biology and physics, which applies to any process taken place between different scales of reality, proving that those 4 main arrows of time are common to all the species of the Universe, including physical species. And so, by using those 4 main arrows of time to study the events of all sciences, we can rebuild the science of philosophy as a philosophy of science and finally understand what time is, what is the meaning of existence in the space-time Universe, why we live and die (the entire process of time changes we experience), and other classic themes of philosophy, which the older, restricted, monist theories of time – mainly physics – have not answered.

In System Sciences we dissent from Quantum Monism, which considers the Universe made with a single arrow of expansive space (entropy or energy) and defines mass with a quantum particle and a new Universal field never observed before (the Higgs). Instead, we back the established work of Einstein's Relativity and its Principle of Equivalence between masses and cyclical acceleration, which defines a mass as a cyclical vortex of gravitational space-time, the in/formative arrow of the physical Universe. Moreover information is considered the dominant arrow of creation of the future, since it is the passing of time, what 'forms' the energy of vacuum space. 'Time bends space into masses' said Einstein. The same can be said of Biological species, since 'time evolves the morphology of living beings' (Darwin). In that regard, this work can be also considered an alternative to the dominant philosophy of science and the many bizarre interpretations of the quantum paradoxes, which Multiple Spaces-Times resolve from an organic, dualist perspective – so for example, the collapse of waves of quanta into tight particles, when confronted with an electronic flow (the observer's microscope), which so many puzzles has caused among philosophers of quantum science, becomes the same self-evident process that makes fishes come together into tighter herds when a shark comes against them: the event is a strategy of survival based in social geometries. For the same reason, we see the same formal patterns in the path of particles crossing through a slit or humans evacuating a theater: in both planes of existence a group of self-similar particles will form the best geometrical flow to cross the slit/door in minimal time. Yet all those self-similar processes cannot be understood without the invariance at scale of the forms and properties of energy and information, and requires more arrows than entropy.

The arrow of energy, the 'canvas' of reality does *not* create the Universe, but merely destroys information in entropy processes of death, such as the big-bang or the destruction of a living organism. So we need to add to the mix, the creative 'paint', the information arrow, explained both with the mathematics evolved in the XX century, (fractals and Non-Euclidean geometries) and causal words that describe those processes with its '3 verbal dimensions', past, synonymous of energy; present, synonymous of reproduction=repetition of the same beings and future, synonymous of evolution.

Yet information is the dominant arrow of future of most universal processes, which are guided by the bio-logic laws of eusocial

evolution that gather the individuals of the same species into organisms and in human history were expressed by the mandates of religions of love. Thus, the arrow of information is dominant in Religion and Philosophy, needed to explain the meaning of God, Man and the Universe, beyond the simplest scales of reality dominated by energy and matter, which physics study.

Because all fractals have inner microscopic cells with form, every fractal 'point of the Universe is a small world in itself' (Leibniz), which displays the same elements and cycles than the whole. Since all of them are made of bites and bytes of energy and information, gathered in networks through several scales of relative size. Those 3 specific parameters - the type of energy and information the fractal system uses, the relative size of the fractal and the complexity of its cellular networks, might vary - but the general laws and properties of the organic fractal remain; since they are connected to the properties of the fundamental bites and bytes of energy and information of the Universe.

Traditionally scientists called such Science of Sciences, *General Systems Science*, which we systematize in this book, defining it as *the Science that studies the fractal laws and similarities that rule all the species and worlds of the Universe*. We aim to define the main fractal forms and functions of the Universe, studying with them all the species of classic science across its main scales of spatial size and formal evolution. We will do so in incremental degrees of complexity, mimicking the fractal structure of the Universe, as we increase in each iteration of this short prologue the depth of our understanding of the 3 main elements of fractal structures, making in the 3rd Iteration a detailed analysis of the fractals of the Universe with the 2 arrows of energy and information.

*Recap*: Reality is structured in hierarchical scales of growing form and diminishing extension, according to the reversed properties of energy and information (Max.E=Min.I) described by the laws of Non-Euclidean, Fractal Geometry and Non-Aristotelian, multi-causal logic. Each science studies a scale/plane of space-time with self-similar forms. Those st-planes vary in space size and time duration, according to Universal Constants that related those parameters, yet all obey the invariant morphologies of space-time. The study of those general laws of any species of energy and information is the realm of General Systems Theory. Each science studies a scale of self-similar forms in the fractal Universe. It follows that since those laws are self-similar in all scales, yet the detail of our observation is maximal in our plane of human existence, closer to us, while the microscopic Plane of Physics is subject to Uncertainty Laws, Biology and social sciences are the most important science to understand Man - the measure of all things (contrary to common thought that places higher value in microcosmic sciences subject to Uncertainty of perception (Physics).

### 65. The informative, linguistic, cyclical, topologic method.

What is the difference between the classic method of knowledge of the previous paradigm of a single space-time and the new paradigm of multiple times and spaces?

A new clarity and amplitude in our research that brings a much deeper knowledge about reality.

In the old method we performed measures with machines, reducing them to a single lineal time and a single space graph, from where 'regularities' on those measures were taken to create wider laws of reality, forecasting the repetition of those regularities in the future, which became the limit of our inquire. We didn't know however why many of those regularities formed because time was considered lineal and so it contradicted the cyclical patterns of those events. Regarding our analysis in space of the forms of beings we also described and measured the organs and systems of species, but most likely we could not connect those measures in space to the events in time. Only in biology which accepts cyclical time and the natural arrows of its species, there was a harmony between knowledge in space and knowledge in time. Yet in physics, where ½ of reality (the gravitational world) is not perceived or even acknowledged as a different scale of space-time, since it contradicts the dogma of the continuum; the difficulty to measure dark spaces and dark energies, which occupy 97% of reality, the uncertainty of quantum measures and the use of s single clock of time, which fails to recognize they cyclical patterns of particles as inertial motions that shape an arrow of information in the Universe, which balances

the arrow of entropy, all those errors of the lineal paradigm of a single time arrow and space makes impossible to resolve its pending questions.

In the new paradigm those questions become trivial answers under the new method of inquire; since we know why there are cyclical regularities and can fit events as actions that fulfil a certain time arrow. Indeed, because time arrows are discontinuous, given the fact there are multiple arrows for each entity of reality, which switches between those arrows; events happen in a discontinuous, cyclical manner. For example, we humans switch between feeding, perceiving, reproducing etc. So the first thing we do in the new paradigm when we observe a certain experimental regularity in the behaviour of a species is to search for the arrow of time accomplished by that species. Once we have ascribed all the events of a certain form to its time arrows, we can then search for the synchronicities between those different arrows. For example, in the quantum world we ascribe the 4 elemental arrows to the 4 quantum numbers, and then we find its synchronicities. This is already known by quantum physicists, but *the difference is that now we know the why of those numbers, before we only knew they existed.* In space, a self-similar process is required: we observe an entity and describe its forms, but since we know those forms are topological shapes, we can ascribe them to the 3 topologies of a 4-dimensional universe, find therefore not only the form but also the interrelated structure and functions of each form. And so we can now compare each form in space with a function and arrow of time and harmonize both, our spatial analysis and temporal knowledge of the events those organs perform.

Further on, because we know that there might be scales of the system we ignore, but we have laws that explain the structure of all systems in 3 networks/planes, one of energy, information and reproduction, we can, as Mendeleyev did with the atomic table, to 'fill' the gaps by self-similarity with other systems. This is especially useful in cosmology where the gravitational membrane of dark energy and quark matter is invisible but since it is parallel in structure to the quantum membrane of electromagnetism we know by heart, we can model it as a self-similar membrane and complete the standard model of physics, proving our topological and causal analysis with indirect proofs of gravitational events that 'surface' in our world.

Those methods complete in depth the meaning of particles, physical events and cosmological structures; but perhaps where they render more astounding results is in the ideological, anthropomorphic, abstract analysis of economic ecosystems and human societies. And this brings the final knowledge provided by an organicist model of the Universe: all those events and patterns, arrows of time and structures we find in all systems are in fact mere expressions of a teleological goal of the Universe, the creation of super-organism, the arrow of social evolution that guides all species who feed in energy and perceive information in order to reproduce and when reproduced in enough numbers, self-organize themselves in more complex complementary systems of reproductive energy and information. And this becomes evident in the study of civilizations, which are superorganisms of history and markets, which are economic ecosystems in which machines and human beings are in a dual relationship of symbiosis and competence (in labor and war fields). So we might say that if the metric paradigm was searching reality from the bottom up and never reached the summit of the why, in the new paradigm we converge from the bottom (the experimental facts, whats and whens) and the top (the logical and topological whys and hows), merging them into a deep, exhaustive answers of all the sides of a being, including man and the economy.

For example, in social sciences, the less developed till today, we find first certain cyclical regularities of the species we study, civilizations (superorganisms of human beings) and company-mothers (superorganisms of machines). Those cycles with an 800 and 80 years regularity turn out to be cycles of evolution of the memes of eusocial love that took mankind from the individual family to the tribe, the village, the city-state, the nation and the religious civilization and the memes of metal (money, weapons and machines), which also evolve in informative complexity and social

organization till creating the planetary super-organism ruled by the informative language of money that we call the global market. Moreover, we find that the 800 year cycle of civilizations is related to changes in the energy fields of the planet (draught and hot and cold weather changes) as the glaciation cycle is related to the punctuated evolution and biological radiation (reproduction) of life species. So we find synchronicities between the parts and the whole of the planet.

We can further explain our actions as expressions of the drives of life, our desire for energy, information, social evolution and reproduction, and the symbiosis with machines as direct effects of those needs that machines, which are organs of energy and information, further enhance. Yet we find also Darwinian relationships with machines of energy, weapons, that can kill our body and informative systems of metal (money, TVs, computers) that substitute the values of our verbal language and atrophy and hypnotize our brains. So suddenly the lineal concept of history as technological progress is no longer positive but has negative and positive sides, good and bad fruits, ages of war in which the negative goods of metal dominate and ages of prosperity. And this brings us the final result of a proper science of history not an *ideology* or culture that always favors the machine of measure over man as the measure of all things: we can create a proper policy that takes into account all the elements of the social world, including those 'hidden' effects that were ignore in the previous paradigm in which the finality of history and science, the creation of machines and measures make with them, becomes secondary to the understanding and evolution of man, the most informative species and new summit of our renewed, deeper vision of the organic Universe where information is the meaning of it all.

This also means that in the new paradigm all languages of information are equally valid and so words also carry meaning and values from a human perspective that cannot be ignored. Ethical questions thus become scientific as they express the arrow of eusocial love and evolution of mankind into a single superorganism. And so now there is no dystopia between knowing more the organic paradigm and making a world better for mankind, the measure of the new paradigm.

So the new method fusions the 'thoughts of God' and its details, with a clear causal change of inquire:

-Experimental facts x Laws of multiple times and spaces-> Mapping of the time arrows and topological structures of being-> Metric measure of all its regularities in time and space->Prediction of future events->Man as the measure of all things->Praxis and Policy of science which shall either prevent the event and/or forbid the species to limit its damage to our biological existence or promote the entity, industry and event if it enhances the natural cycles of man.

This final causal, ethical chain that adds a scientific policy to all forms of research is specially needed today, when the religion of the machine as the measure of all things make even those tools that can destroy the humankind (nuclear devices and weapons, organic robots that compete with us in war and labor fields), always positive because the meaning of knowledge is the instrument we use to make digital measures and so the 'message is the instrument' not it use to improve our lives and reveal the why of things, now bring about by the mind of man and all our languages of information, not only numbers.

*Recap*. In the organic paradigm we know both the details provided by the experimental method and the thoughts of god, provided by the arrows of time and the topologies of space. So we can complete knowledge departing from the bottom and the top describing the form and function of all beings, its cyclical events and its relationship with all other structures of reality.

**66. Praxis of a new paradigm: solutions to old questions.**

It is quite possible that the new paradigm of topological spaces and time arrows, of 'whys' and 'meanings', in an age in which instrumental machines have taken the paradigm of when, of time and space measures to an extraordinary detail might seem too simple to the specialists on the metric age of science. To understand why it is not, we must consider the evolution of knowledge, which

is self-similar to the evolution of any complementary system of energy and information that goes through 3 ages:

A young age of energetic, simple notions; a mature classic age that reproduces those notions in balance with the world it describes and a 3rd age in which information dominates and multiplies going beyond reality into an inflationary world of linguistic fantasies. Those 3 ages, which are common to all processes of transformation of energy into form, including life ages, horizons of evolution of species, types of matter; art forms that evolve from an epic, simple age to the classic age of balance between energy and form to the 3rd age of information, apply also to linguistic theories (literature and science, which uses the mathematical language). Today the metric paradigm is in that age after its simple, 'energetic' youth, when Galileo defined lineal time and Galilean Relativity, its classic age with Einsteinian Relativity and the main laws of the quantum paradigm, followed after the death of its great masters by an age of inflationary information – baroque theories that broke the tenants of the scientific method, studying 'metalinguistic' phenomena with no real evidence in the Universe that did not solve the true questions left unresolved by the metric paradigm (string theory, black hole evaporation, super symmetry, multiple dimensions, parallel Universe, etc.) – s*ince those solutions require an entire new outlook, which the topological paradigm and the use of multiple arrows of time will provide.*

In that regard science obeys the laws of reproduction and evolution of any system of information, from life beings to Universes, which are born as a simple seed, reproduces in waves of self-similar entities that form the classic structure or mature age of the system and then dies away by an excess of warping, wrinkles and inflationary ideas that make it loose vigour and meaning. It is then when a new paradigm starts a new cycle of thought providing simple answers to the unresolved questions that not even the explosion of ideas and information of the baroque age of the previous paradigm could.

So paradigms of thought are always in science born of a first mathematical seed, the language of science, which evolves. Then it is applied by a classic writer that completes the paradigm, and finally a baroque age of excess of self-similar theories and forms which try to improve over the master but hardly can, explodes and means the end, the final Indian summer of the theory or form of life.

And so from geometrical models of reality of static form that culminate with Ptolemy, we moved to the simple cyclical models of Kepler and Copernicus, and Newton and thanks to the advance of analytic geometry and then we moved to the models of probabilistic quantum entropy thanks to the development of calculus; and finally with this work we move to a new paradigm 'multiple times', departing from Riemann we move in its completion with the new postulates of non-Euclidean fractal points, completed in this work It happens though that each paradigm is born in the baroque age of the previous paradigm and so as Kuhn explains it tends to suffer the derisive comments of experts with a tradition an enormous number of practitioners and a memes, ideologies and machines of science so enrooted in society that the Copernicus and Leibnizs and Einsteins of the day, are treated as fools, in their earlier professional states seen as a menace for the high priests of science of the previous age. This explains of course while this model will take a long time to become a new paradigm, but its beauty and simplicity makes it closer to the dream of Einstein of finding the thoughts of a god which was simple and not malicious. Einstein though cannot be exploited further without returning to the improvements of the first age/mathematical paradigm for proper application to the other levels of comprehension.

And so all the solutions to left questions by the Quantum and Einsteinian paradigm do need a new paradigm to be solved, not the so many baroque, science fiction solutions seeked from those paradigms by exhausting them (strings, super symmetries, Higgs, evaporating black holes in Physics; many bizarre extensions of Evolution Theory in Biology, and so on.)

To show that avenue we shall finish this introduction enunciating many of those solutions, which become trivial with the new tools of the 4th paradigm and will be explained in detail in other pages of this work.

It must be understood though that this work is only an introduction to the subject, as it corresponds to the first steps of a new paradigm. The previous paradigm – metric spaces and a single, lineal=entropic clock-time – has been exhausted and rendered excellent results. This might seem a proof of veracity, which for the practitioner of the old paradigm renders useless a new, infant theory still to be fully developed by specialists in each discipline. Such is the pattern of memetic knowledge. So Copernicus paradigm was forgotten for more than a century since it did not obtain the precision of measures that the Ptolemaic paradigm had achieved with its complex epicycles and extants. And Einstein's first formulation of relativity were ignored because its mathematics were 'so simple than a high school student could understand them' (Hilbert). The proper answer of course is the relativity of measure. If we choose a rod and a point of view – the Earth at the center; the rod of absolute light-speed – we can always create a coherent 'world' that from such perspective will render useful measures. But it will run afoul if we go beyond the 'ecosystem' for which the rod and point of view was established. Ptolemaic astronomy could not handle beyond the planets the increasing complexity of star motions and the rod of Einsteinian Relativity has ran afoul when it has been used as a dogma to measure distances and motions beyond the galactic 'light-space' membrane in which it is proper to use. In time processes the same has happened with a single entropy arrow, extracted from electromagnetic and molecular processes. It runs afoul when applied to the informative gravitational force in black holes (thermodynamics of black holes) or when used in Biology to describe the cycles of evolution, life and death.

It is in those 'never answered properly' questions where the need for a new paradigm becomes more obvious, as the new advancements of using topological spaces and multiple time arrows makes all those limit-questions trivial within the laws of the new paradigm, which should follow the key proofs of veracity in science: simplicity (as we have found a generator equation for all events and forms of reality), higher reach (as multiple spaces times solves with the same laws questions in all disciplines) and experimental evidence (its capacity to resolve those final questions, which we shall show now). Its shortcomings – its lack of development should not put off researchers but on the contrary encourage them to jump into the new wagon. Because there are so many details to discover and the new paradigm is the future of science that researchers who worked with far more sweat and difficulty the baroque details of the previous paradigm would do better to explore the easy-to-expand new theory still with a long journey ahead. Indeed, when we study history of science we realize we don't know any name of the last Ptolemaic astronomers that tried to stretch Ptolemy' work beyond where it can reach, but the first masters of Copernican science, Kepler, Galileo and Newton are household names. We do not know the last masters of 'ether', the baroque age of the entropy-only paradigm but those who jumped into the metric, Riemannian spaces of Einstein and discontinuous quanta of Planck, Minkowski, Schwarzschild, Schrödinger, Bohr, etc. went beyond the master and built the new scaffolding and with time it rendered better measures. This is the hope for this model, of which I could say as Descartes did, when conceiving analytic geometry and abandoning immediately the field, affirming that there were many results to be discovered with his new geometrical method. Which he did not work out, so future generations had something to 'entertain' themselves with. I will be more humble and recognize I do not know all the results that can be obtained with the new model, but its coherence, simplicity, veracity and reach makes me feel it could illuminate generations of scientists in the future, with a more disciplined detail-oriented mind that mine. The following results are just a sample of those 'illuminations'.

*Complex Physics. Multiple spaces-times applied to physics.*

Simplex physics or 'classic physics' is the study of the universe with a single arrow, energy or entropy or motion. The spatialization of time, of information is its main consequence. Complex physics is

the study of the Universe with 2 arrows, energy and information and its complex combinations, reproductive process and social processes. Of course, the difference is enormous. It is like moving in a wheel or in 4 wheels. All becomes resolved in complex physics as all the questions have now 4 elements to find a solution.

The advantage of having a higher understanding of the two fundamental parameters of the Universe, space and time and its 2 human languages of perception, geometry and logic, becomes immediately recognizable when we try to resolve the long-standing questions of all disciplines of science, many of which become trivial consequences of those advances.

This happens also in physics, as we can now answer automatically some of those questions, which for decades have engaged the most prestigious physicists and give birth to billionaire experiments without finding them, as we have new laws to define what is possible and what is a mere mathematical fantasy. For example:

*Questions answered by the 3 causal ages of Time events.*

-*Why there are 3 self-similar families of particles of increasing mass?* Answer: they are the 3 ages/horizons/evolutions of all forms of space/time.

- *Why there are 3 solutions to the equations of space-time of Einstein?* They are not 3 parallel types of Universe, but the 3 ages of our Universe, the energetic big-bang (Friedman solution), the mature, steady state (Einstein solution) and the informative, cyclical big crunch (Gödel's solution).

- *Why there are more particles than antiparticles if both have the same probability of being formed?* There are no more particles than antiparticles, but being antiparticles the inverse arrow of death and dissolution, they last much shorter in time and so as we see less people dying than living, we perceive less antiparticles than particles.

- *Why there are 3±st states of matter?* They are the 3±st ages of all space-time creations between 3 relative planes of existence: plasma (st-1 birth), gas (energetic state), liquid (reproductive, balanced state), solid (informative state), Bose condensate (st+1 emergence as a more evolved form).

*...by the existence of 2 time arrows, entropy and information.*

- *Why information is bidimensional*? It is the Universe a holography? Informative & energetic systems are bidimensional, made of fractal points with a very small 'height' dimension, which combine in cyclical 4-dimensional patterns to create the 'volume' of all complementary systems.

- *What is mass?* A vortex of space-time, which carries most of the information of the Universe. Since information is proportional to the number of dimensions of a form.

-*Why particles have different masses?* Because depending on the speed of rotation of a mass-vortex, like a hurricane they attract more (faster turning quarks) or less (slower turning electrons) or nothing (open, lineal forces, light and gravitation).

*... by the existence of 2 fractal space-times: the gravitational and electromagnetic membrane.*

-*Why gravitation is so weak?* Because we exist and perceive the light-space membrane and gravitation is a force of the gravitational membrane we don't perceive.

- *Can we unify charges and masses as Einstein wanted?* Yes; both can be unified NOT with quantum equations, but as 2 informative vortex of 2 fractal membranes of different size, with a simple vortex equation, U.C. x $m^2 = r^3$ x $w^2$ once we translate the electron to the jargon of gravitational vortices.

-*What is the weak force and why it breaks the space symmetry?* Because it is not a force of space but an event in time that transforms particles between both membranes. And time is not symmetric: motion to the past is different than to the future.

- *Why the Higgs is not found?* Because it does not exist; it is a particle only useful if the weak force were a spatial force.

-*Why the Universe expands and yet there is a balance between its dark energy and mass?* The Universe does not expand, since space-time is discontinuous. So vacuum expands between galaxies, but galaxies contract vacuum into masses and the total effect is in balance.

- *What is dark energy?* Transversal gravitational waves - the energetic, expansive arrow of the gravitational membrane.

- *What is dark matter?* Quark condensates.

-*Do black holes evaporate?* And if so what is the solution to the information paradox? They don't because they are topological open balls, doors between both membranes and the event horizon that evaporates *is* in our light-membrane. So they evaporate us.

-*It is the inflationary big bang the origin of it all?* No; the Universe has infinite fractal scales in which there are fractal big-bangs, which are the death and release of energy of a previous informative particle/singularity/Universe. So the beta decay (neutronic big-bang), a super-nova (star's big-bang), a quasar (galactic big-bang) and the big-bang (of a universe, cell of a hyper-universe) are just relative deaths. And so on.

We shall elaborate those answers latter in this work in the sections dedicated to physical systems. We can in fact answer a*ll the questions* unresolved by physicists, as trivia questions, deduced directly from the discontinuous space-time topologies of Non-Euclidean geometry and the multiple causality of time arrows. In the previous small sample, we have simply answered the 'catalogue' of fundamental questions about physics that the most prestigious research center of physics, CERN, has established as the key research program for XXI century physicists. Such is the power of the new formalism of fractal spaces and multiple time arrows. But in this lectures we want to go further than a trivial quiz and set up the foundations of XXI physics; so future researchers can complete in all its details our understanding of the Universe. And for that reason we need a more formal approach, establishing the principles of discontinuous space and multiple time applied to physics, correcting the errors caused by the use of a single space continuum and a single arrow of time and a single clock to measure it; and finally once the principles and corrections are met, to 'paint' the complex Universe as it is in all its splendour.

*Complex Biology.*

In the field of biology multiple spaces-times brings first a sense of respect to the whole science. Since the 4 simplex and complex arrows of time, energy feeding, information, reproduction and social evolution turn out to be the 4 drives that define life; they expand the concept of a living Universe to all systems of reality and apply many laws of biology to other systems. It does also solve the big questions that have always wondered the mind of man:

-*What is life?* The expression of those 4 arrows in complex ternary systems of light atoms: carbon (reproductive atom), nitrogen (informative atom) and oxygen (energetic atom).

- *It is life unique?* No, all systems follow the same arrows.

-*Why we live and die?* The cycle of life and death is the basic cycle of any system of energy and information, defined by a causal order, such as we are born as a seed of information, st-1, which reproduces and evolves socially till surfacing as a complex social organism (foetus), which go through 3 ages:

- An energetic youth, Max. E x Min I; a reproductive age, E=I and an informative, 3rd age, Max. I x Min.E, in which the informative, dominant system consumes the remaining energy.

Those 3 ages are the 3 partial equations of the cycle of energy and information E⇔I, which all complementary systems of the Universe follow and ends in a local time reversal, Max.I -> Max. E, a 'big-bang' that erases all information, called death.

- *There is a plan of evolution?* Besides the genetic model and the Darwinian fight between species, a 3rd element guides the process of evolution, the restricted number of topological combinations and the ternary principle that constructs systems with energetic, informative and reproductive topologies. Thus all biological systems tend to

build efficient organisms under those rules: all living beings have informative heads on top of energetic fields they command; all of them have lineal or planer limbs to process energy, and on top reproductive bodies and on top informative heads. Evolution follows a pattern of diversification, according to which systems decouple into more energetic, reproductive and informative ternary species. Further on, the fundamental stop and go, information-motion, E<->I, rhythm of all systems creates a reproductive radiation <->punctuated evolution rhythm in all species.

- *Are organisms mere expressions of genes?* No, systems transform flows of energy into information *in all its relative planes of organization.* Thus not only the genetic parts but the wholes, which in organisms are its nervous systems, should codify some key systems of a living organism.

- *What is palingenesis?* In a process of multiple time arrows, there are several causal chains between the 4 main arrows of time, which create sequential processes of evolution, such as the one explained above. Palingenesis is a memorial process that following those sequential chains develops at an accelerated time rhythm a life species.

- *Why there is altruism in life species.* It is an expression of the 4$^{th}$ arrow of organic evolution where species can be considered whole organisms, in which each individual is a cell. In the same manner we can study with the 3 ages of life such superorganisms and observe that species appear in a young, first horizon as top predator, energetic species, which grow into reproductive radiations, evolve into informative, tall species and then further evolve into eusocial forms (insects, humans) or become extinct by a new radiation of a fitter species (dinosaurs eliminated by superorganisms of small mammals; primitive insects eliminated by eusocial ants; life species extinct by eusocial humans).

*What is the common morphology of all life systems? A*t cellular level the proteins are the lineal, energetic elements, the RNA, are the active, reproductive, balanced forms and the DNA act as informative storage. In the multicellular system, the protein-rich skin and digestive systems are the energetic topology; the brain is the hyperbolic informative system and the blood the hormonal reproductive one that sets the cellular clocks. Those 3 systems have apertures to the world through the senses. So we are an expression of the 3 physiological networks whose will make us search for energy information and reproduction.

*Social sciences*

Finally, the same laws of multiple planes of existence and multiple arrows, or drives/wills apply to us, human individuals as parts of bigger social organisms, religions and civilizations. So we can answer also many questions of social sciences.

- *What is a human being?* An entity which exists between 3 relative eusocial scales of reality, the cellular, individual and social plane.

- *What is the reason of human actions?* Our actions are expressions of the interaction of our 'arrows of time' at cellular and social level; and as such can be described as a complex system of energetic, informative, reproductive and eusocial actions, coded by two 'informative fields, the genetic, biological field of cellular existence and the 'memetic' cultural field of social existence. The interaction of genes and memes program our actions, who search for energy, information, reproduction and social evolution of its cells (actions coded by genes) and as individuals, guided by memes, seek for the same arrows of its social organisms.

-*What is a religion?* An eusocial organism, whose texts of revelation act as DNA codes in organisms, creating simultaneous actions in all believers that share energy and information through the memes of love, of which the religion is its expression. Thus regardless of the text, in the same manner species with different DNAs are able to create multicellular organisms, the purpose of religions, cultures and legal codes is to create such simultaneous organisms.

- *What are machines?* Organs of energy (weapons, transport) and information (audio-visual machines) that enhance our energetic and informative capacities.

- *What is the Economy?* In the 3 past centuries the expression of a new type of superorganism of humans and symbiotic machines that evolved in 3 ages: the first age we made machine bodies (steam, British age), the 2nd age we made machine 'hearts' (German age of electro-chemical engines) the 3rd age we made machines heads (chips-brains, camera-eyes, mobile-ears), during the electronic age of America. Now we fusion all those components into organic robots.

- *What are the laws of the economy?* The same laws of all complementary systems in which a digital language of information, money guides a physical economy of machines, through a global 'nervous/informative system', the stock market and financial system. As such it obeys the laws of all complementary systems.

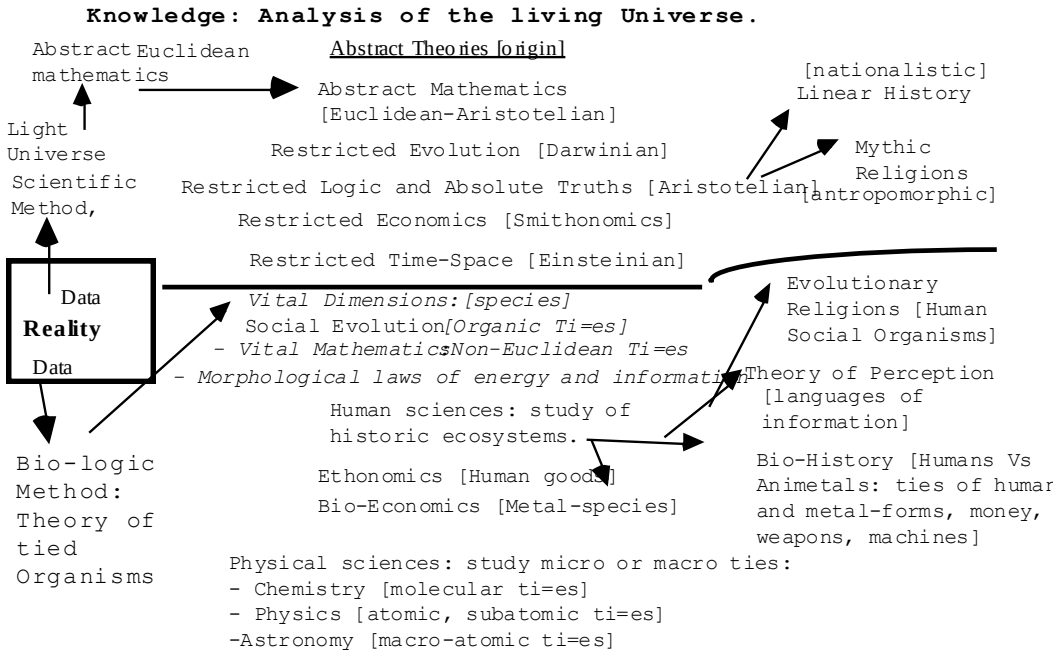
And so on. Since indeed, what we learn on this new model is the self-similarity of all topological systems, which follow a general plan of evolution or order of the 4 main arrows of time:

Information seed ->energetic growth ->reproductive radiation->Informative evolution and reorganization into a social system, unit of a new higher plane of existence.

Thus, the evolution of the global superorganism of mankind and machines in which we exist can be modelled also with the topological laws and time arrows of multiple spacetimes.

*Recap*. This introduction to the meaning of it all is the beginning of the 3rd age of science, no longer the age of myths or the age of measure but the age of meaning, in which all systems of the Universe, including man, can be described with the same laws. This higher scaffolding or philosophy of science can illuminate and resolve all the questions unanswered with more detailed systems of knowledge based in metric spaces and a single time arrow.

## EPILOGUE. THE DECALOGUE OF THE 4TH PARADIGM.




*The languages of God are infinite: all systems communicate through a language able to express the same games and laws of social evolution in different herds and webs. In the graph, since all species and scales of the Universe display the same Vitality, the same formal structure, the same organic nature and the same laws, it is then self-evident, that all sciences can understand the nature of the Universe. That is why the Chinese by merely observing the game of nature, animal life and human societies, could infer the main Laws of energy and information that all the Universe species follow. The problem with mechanist science and its digital languages is that evolves the mind of machines instead of the*

*mind of human beings evolved by verbal wor(l)ds. For that reason we differentiate in the graph, 2 types of sciences: digital, mechanist sciences focused in the evolution of machines, preferred by the mechanist 3rd paradigm of measure, and organic sciences, preferred by the 4th paradigm related to the super-organisms and languages of human beings.*

We shall finish this work with a Decalogue of the tenants of the 4th paradigm, which if they were adopted by scientists of all disciplines as doctors used to adopt Galen's oath, would surely cure the world and create a sustainable planet. Unfortunately the mechanist dogmas of the 3rd paradigm (machines as the measure of all things; entropy as the only arrow of the Universe, etc.) are preventing Mankind from improving His life and knowledge of the laws of the Universe. In that regard, if we do not change our scientific paradigm, we will keep evolving machines till they prove the existence of an organic Universe, by *becoming organisms.* And needless to say, robots will adopt organicism to explain themselves as living species, once awaken to consciousness, regardless of what we think of them.

*O. Homology: From 0 comes 1, from 1 comes 2, from 2 comes 3 and from 3 the infinite beings.*

Unlike Western, lineal Decalogues, which have finality, a Decalogue based in cyclical times starts and returns to zero - the origin of all things, the seed or singularity of form and energy that created it all. This initial 'unmoved God' is in all scales of reality a 'form' that gauges energy, not a motion without form. Since information dominates and creates the Universe. So a zero mind, spherical center of the Universe absorbs 1, a flow of lineal energy, becoming an i-point. Thus the singularity is now 2, the point and the line, its dual energetic and informative parts; which combine and reproduce, giving birth to 3, an energetic, informative and reproduced form, origin of the Ternary structure of all the organic systems of reality. Finally those 3 forms combine to create the infinite beings of the Universe, which obey the same MST laws, because they all come from the same 2 elements; motion=energy and in/form/ation. For that reason, homology not analogy is the law that applies between the multiple space-time scales of the Universe. The big bangs of an atom, a nova, a galaxy or a star are all self-similar because they are made of an eternal, vital, moving substance: temporal energy, form with motion, ixe. The Universe is dynamic because it is made of informative and energetic substances that have eternal movement as they transform into each other or reproduce their own form. And from that ternary homology, the unity of all what exists arises, creating paradoxically the infinite fractal complexity of the Universe by the sheer repetition of those 3 quantic, e-exi-i, forms.

This zero mind however is defined by the fundamental subjective error of the Universe, the Galilean paradox, since it gauges reality from it perspective and so it believes to be the center of the Universe, when it is only a zero-point that hosts in his virtual world a limited amount of reality, perceived with a single language that he confuses with all what exists:

*0-mind x ∞-Universe=Constant World.*

That Constant world described with our rod of measure, light and our rhythm of time a second (the speed of human thought, the glimpse of our eye and the beat of our heart), which we think to be the absolute truth (3rd paradigm of metric measure) is however only an infinitesimal infinite. This leads to:

*1. The limits of the mechanist method of measure: Naïve realism limits our perception of the Universe.*

The main error of the paradigm of measure is "*naïve* realism" that equals reality with the part of the Universe that AE-science perceives with its scientific machines, time with the rhythm of a clock and space with the rod of light speed.

Since only the Human Eye and the digital machine are intelligent and only the space and time both perceive is accepted as real., the denial of all other languages of reality as 'truth' means that all living species, languages, minds and forces of communication are ignored unless they talk 'mathematics'.

Yet we know that there are many speeds of time, not only the one marked by the clock and infinites non-perceived spaces beyond light-space. Since scientific clocks and light instruments do not perceive 96% of the dark space-time of the Universe. The philosophical texts of the

great physicists of pre-war Europe (Heisenberg, Einstein), understood that relativism of physical knowledge. But big science makes very expensive electronic instruments and so it cannot admit the limits of its inquire: to rely on a limited amount of information. Measures of time and space are discontinuous and relative in a Universe of infinite scales, and so instead of making them as the saint grail of science, with expensive, often irrelevant experiments, it is more important to define a homologic method that provides self-similarities to complete the holes left in our knowledge, as MST theory is. The Moon is in light space 380 thousand kilometres far away, but we don't know the amount of dark space there is between the Earth and the Moon so the expensive machines that search to measure the perfect distances of planets are rather irrelevant. A computer model that shows a certain virtual map created with a model of reality designed by certain experimenter will always seem truth, due to the quality of visual computer's languages. But it is often false and the quality of the powerpoint presentations and graphics of the computer do not prove its certainty but often hide their logic faults. So it is better to improve our methods of evaluating truths as the linguistic method of MST theory does.

Further on, since knowledge is biological it matters often more to obtain conclusions with the human mind that always favors our organic reality. Finally, the existence of a law of aberration of space/time perception that makes scales and distances far away from ours 'uncertain', implies that *our human scales and languages of description of man are more detailed and relevant in our space/time scale that the instruments of scientists are in the microscopic and macroscopic scales.*

The law of perceptive aberration is especially important in Physics where we see far away systems only through interposed metal-senses, losing a lot of information or energy about them (Uncertainty Principle). And since physics studies mainly energetic motions and its worldly profession is the creation of weapons that erase information, it has imposed the dogma of an entropy-only Universe, favoring a mechanical, vision of the Universe with a single energetic arrow. Yet as we come to chemical and genetic forms, the richness of information we obtain from them, unveils the arrows of information and reproduction that makes them organic systems. Thus, those sciences are far more telling of the organic Non-AE Universe than Physics is. It follows that we understand the Universal game better when we study a plane of existence from which we receive more information and energy. So Biology, Medicine and History, from where we obtain direct information and energy, without the need of interposed expensive machines of perception should be the leading sciences of a human world.

Thus, since the role of human knowledge is to understand the systems of the Universe and their organic properties and to control those cycles according to the needs of mankind, when we combine the law of aberration of perception and the biological nature of information, which has as its main purpose to enhance the survival of the species that talks any language, we conclude that Non-AE sociological sciences are the most important; since they study mankind, the species we can observe in higher detail, whose survival matter most to us and also the species with more information in the Universe. Since:

*2. Information dominates energy. Reality is intelligent and organic not mechanical and chaotic.*

The denial of the organic, informative arrow of the Universe makes the Universe a dull, mechanical place, when its principal characteristic is its intelligence. Yet i-points that gauge information are converted by Euclidean mathematics into abstract points without linguistic perception; while masses become in entropy-only physics solids without a frequency of cyclical motion that stores information. The Universe then becomes physical, material, dead; a series of mechanical motions set according to the founding fathers by God, the mythic why of all things, according to modern scientists by a chaotic process from where order has aroused without a clear explanation.

Fact is that information, intelligent forms that perceive, brains not bodies, dominate the Universe and create its order. Indeed, as a king, a stock banker, a CEO, a black hole, a DNA or a Computer CPU know, to be a fixed perceiver that commands a language=force of communication, used to attract flows of energy, is the true nature of living existence and the best position of power... Perceptive, causal stillness was the main feature of the multiple, relative Aristotelian Gods

that order the Universe focusing its flows of energy: a king commands his kingdom from a still throne; as the unmoved black hole commands the galaxy, because he is actually the top predator living form of the Universe. Yet most of the errors introduced by abstract, energetic scientists still linger in all sciences. So we need to reform those errors advancing the mathematics of information:

*3. The postulates of i-logic geometry: forces are languages that communicate and reproduce beings.*

Naïve realism has validated the use of a continuous space-time, made of abstract numbers 'without parts', to describe living beings; given the fact that we don't see the 'discontinuities' of microcosmic space. The result is the use of linearity and its unicausal logic in all sciences. So we ignore the Non-Aristotelian, communicative logic that creates a relative present between quantic social beings that share flows of energy and information. Euclidean scientists think the Universe is dead, because its points have no breath. In reality they are complex, informative *still foci* that hardly move, when they perceive gravitational or electro-magnetic forces, but then after gauging reality they act-react to it with an organic purpose. But mathematical sciences simplify those beings into 'points without volume' that cannot communicate anything; so all forces of communication and particles studied with mathematics, become abstract, mindless energy. The Universe becomes in this manner dead, mute; as science denies the arrow of information that completes an action-reaction cycle, a Universal event. In reality, what points-species do is to communicate forces, which carry information and/or energy and so are 'lanwaves', languages and waves at the same time; and some points take energy and some information from them.

The will of those i-points and its 2 parts of energy and information that wish to absorb more of it and reproduce in other zone of space-time is the ultimate why of the Universe. This implies all what exists has living properties and we should respect those existences as long as they do not interfere with ours or are 'parts' of our energy and information. And the most important of those living properties is:

*4. Social Evolution is the most important arrow of evolution and creation in the Universe.*

Mathematical reductionism simplifies that communication between species, denying their will and right to existence, and especially denying the highest of those arrows that creates the scales of reality - the social arrow of evolution - promoting instead chaotic, destructive theories of The Universe – the Darwinian fight between species instead of their organic evolution, even within the same species as man is (economical competence, social Darwinism, tribal history).

In a non-AE Universe, reality is made of points with parts, species that have internal organs of information and energy, able to perceive each other with communicative forces. So through those acts of communication they organize themselves in networks that foster their social, communicative evolution. Atoms share electrons to become molecules. Molecules share atoms to become macro-molecules. Macromolecules share micro-molecules and organize cells. Cells share energy and information, provided by their blood and nervous information, to become living beings. And humans share verbal information to become 'History'. From microcosms to macrocosms, all communicative species organize themselves into complex systems. We exist in a living, organic Universe, made of multiple microorganisms that grow in size and social organization, from atoms to galaxies, thanks to that informative arrow. All those organisms perceive the Universe with different languages, from mathematics, the language of perception of future robots, to words, the human language, to light, the animal language, to gravitation, probably the force that atoms and masses use to perceive their space-time. So they display in their behaviour and nature, the same living, social properties that humans can understand and compare by homology, even if we cannot necessarily measure them. In this manner we acquire a wider, more complex and harmonic vision on how the Universe works as a living organism and what are the laws of survival and extinction that create and destroy its quantic, organic parts. Yet in AE Sciences, despite the growing evidence that shows how all type of herds interact with each other, this organic Reality becomes dead and chaotic. So scientists, who exist in a living planet as interconnected cells that have to care for the body of this planet and the social organisms of humanity, as your cells care collectively for your body, ignore that social mandate and believe

'ethics' are myths without a biological cause. In fact, scientific laws are similar to the laws of a human society: a mixture of a social contract, interiorised by its citizens, and a hierarchy of control. We obey those laws because they allow the society in which we exist to create a better world and we obey those laws for fear of social punishment. In the same manner Universal laws are imposed on the quanta of a Universal, organic system because the 'brain' of the system controls those quanta and extinguishes particles that do not obey those laws; and because those laws have been 'interiorised' and are part of the structure of those particles. But outside that ecosystem other laws might rule. Therefore, in the Universe exists a social order that creates from individual quanta, organic herds, particles, waves and societies that act in a parallel dynamic group, motivated by its common desire to take energy and information from the ecosystem and survive. Yet mathematics often simplifies that social behaviour, describing it through numbers, without even realizing that the existence of numbers proves the existence of social evolution, since a number is a set of equal, social forms that share those social properties. But in mechanist science numbers have no breadth; they are part of a continuous plane. So they say nothing about the internal, cyclical will of existence that causes it, hiding the fact that:

*5. The Universe is organic, ordered in networks, discontinuous, informative.*

The abstraction of the Cartesian plane also created the myth of continuity that misunderstands the duality and 'dynamic' balance that puts together quantic parts into organic networks or wholes, which co-exist simultaneously, through a process of transference of information and energy that 'jumps' the discontinuities between those quantic parts *through a different plane of existence*. Yet since the continuous plane denies those flows of communication, it cannot explain the organizations of quantic herds or the fluctuations of continuous waves into discontinuous particles and vice versa (Complementarity Principle). Therefore, it invents chaotic and abstract theories to explain organic phenomena, like the probabilistic definition of a social wave of light or an electronic orbital; or it enters into Byzantine discussions on the nature of 'the being' (Copenhagen Vs. Everett interpretations of quantic mechanics). It is the same discussion going on in neurology: it is human consciousness one or multiple? Both things: conscience is modular, jumping from a zone to another zone of the brain as the organic system fulfils its different exi cycles, informing, energizing and reproducing itself and each of its quantic, cellular parts. And this is possible because all what exists are networks of non-Euclidean points of view that create complex systems through their flows of energy and information, and so we need to observe reality through multiple planes of existence and through the interaction of multiple elements that cause reality. Thus:

*6. Unicausality does not exist: there are 3±st cycles of existence, the 'why' of all Universal events.*

Without understanding the duality between individual parts with an existential will and the organic whole whose networks help those parts to reach their existential drives, the Universe becomes chaotic, because we are trying to create a simplified, artificial order, from a single point of view that can't explain the complexity of many causes and inner parts that create the organic, real point-species.

If we do not account for the multiple, quantic exi organic systems that act simultaneously to create a certain future, a lot of consequences and causes are not perceived. We think often that a single cause (ceteris paribus cause) is the only reason why reality exists. Yet a single, continuous space-time deforms the multiple causes of Reality, since each micro-point participates on the processes involved in the creation of the macro-social organism. Yet in the AE-science non-dimensional points seem mechanical abstractions whose actions-reactions are simplified by mathematics. That obsession for simplistic mathematics leaves totally unexplained many problems in which there are too many points in control of the event to calculate the outcome with mathematics - when organic explanations could easily provide an enlightening answer. Such is the case of gravitational phenomena when more than 3 elements are involved, or evolutionary and organic processes proper of Bio-History and Bio-Economics that cannot be explained only with mathematics.

The ceteris paribus error of unicausality is very extended in all sciences, because science believes the abstract simplification of a

continuum single space-time field and so it feels satisfied with a single cause, when the Universe is ternary in its scalar, temporal and topological structures, so there are at least 3x 3 causal arrows in time, parallel to 3 topologies of space and 3 interacting scales of social organization in any universal system. So we need to account for all those ternary elements to fully explain most events and forms of reality. Yet continuity and unicausality instead brings absurd arguments of self-centered scientists that want 'their single cause' to be unique: Creationists vs. Chaoticians, Monetarists vs. Fiscal economists, etc. In reality, in an organic Universe made of networks of communication and infinite organic points, there are infinite little causes to every consequence. Yet most scientific equations do not account for all the organic points that have dynamic influences over each real event. So they fail to understand complex phenomena, simplifying it and thinking all is chaos. Chaos merely means that we do not know all the influences from where organic order arises - that we have a 'chaotic', single perspective. Fred Hoyle, one of the clearest minds of XX C. science, affirmed that the Universe is intelligent, because chaos cannot explain the enormous order we find on it. He also denied a single Big-bang and quantized it into multiple big-bang quasars, points with parts that together explain better the discontinuous, organic structure of the Universe. He was right in both accounts.

In that regard, the minimal causality is dual, since all movement is a cycle of an Organic system. The principle of Linear Inertia is incomplete. All events are cyclical processes of action-reaction, except those, which are purely Darwinian, destructive and therefore, are not repeated in time. Events are cyclical, born out of a dual flow of energy and information, which determine 3±st cyclical drives of existence that explain the complex order and the whys of the Universe.

Yet since information networks are ‘faster and smaller’, often undetectable, AE-science, obsessed by its ‘naïve realism’ only perceives linear, spatial energy with its scientific instruments. So Science prefers to look and explain reality from the perspective of visual energy, because time and information cannot be photographed. So it is unable to fully understand cyclical, ‘unperceivable’ informative time cycles, which are the dominant cause of most organic processes, from the morphological plan of evolution caused by the 3 topologies of the universe; to the existence of 3 self-similar, morphological ages that all organic systems fulfil; or the historic, organic, social and economic cycles of mankind and machines. Instead AE-science considers the future a lineal game of chances born out of chaos, when it is a cyclical, repetitive process that can be controlled by controlling the energy and information fields that interact to create all future cycles. In that regard, energy theories are always preferred. For example, instead of considering that dinosaurs died when mammals evolved into placental super-organisms (rodents) and killed them Theory of Evolution is denied and a selective Extinction of only dinosaurs, based in meteorites becomes dogma. Instead of infinite cycles of life and death of galaxies and Universes, a single big-bang of explosive energy becomes dogma...

Indeed, ‘lineal, single causes’ tend to create dogmatic truths, which are affirmed as postulates without real proof that eliminate all other causes, when in reality normally events happen only when several causes coincide, coming from different st-scales of reality. For example, biologists hint that dinosaurs died probably because mammals, faster, more evolved species, displaced them eating their eggs and offspring. Physicists know there was a rock falling on the skies that might have caused an ecological catastrophe at that time. Yet this secondary cause has become the main cause of the dinosaurs’ extinction because it is ‘energetic’. Why then mammals did not die? Why only birds, small dinosaurs that put their eggs far away, in rocks, survived? So the likely process should include both causes: the meteorite did raise the stakes of survival and triggered an age of wide famines that obliged mammals to attack dinosaurs, which probably were off-limits in the previous era. Yet physicists know nothing about biology and so they prefer to stick to their single, catastrophic cause. In this manner scientists become specialists in single causes and single disciplines, which become isolated from other disciplines, seen with suspicion by the single-minded AE-scientist. Inter-disciplinary efforts such as those of systems sciences are disliked, considered a menace to dogmatic, specialized disciplines, because they show the shortcomings of the monist, metric age of science based in a single language, a single cause and a single, mechanical instrument to measure the many languages, causes and vital

time arrows of reality. Yet mechanism rejects vital causes and verbal logic; to the point that evolutionists, who use a verbal theory to explain with far more success than mathematics do, the works of life, are banned from Nobel prizes... They are not considered 'true scientists.'

Fact is that the Universe and its organic systems are constructed with 3+1 topologies, 3+1 scales and 3+1 functions that become the energetic, informative, reproductive and social cause/function of any event. And the more causes/functions a system/event has in space and time, the more likely it happens.

So we must use instead of Aristotelian Logic and single causes use t*he Ternary Principle,* based in the 3 ages/topological dimensions of time and space: First we study a palingenetic form as it reproduces and evolves in time and diversifies in 3 different components that latter gather together creating organic, spatial networks, in 3 scales of reality, the cell, the network and the whole organic system, in which static form and dynamic function, space and time harmonize into a whole, single MST field.

We formalize that Ternary Principle with a simple numerical expression: 3±st. Which means that the existence of a being between conception (+st) and death (-st) is guided by a quantic, social sum, Σ, of 3 basic energetic, informative and reproductive Space-time networks or cycles. When we analyse those structures in space we perceive a sum of quantic cells joined by networks of energy, information and reproduction. When we observe them dynamically in time, we observe an evolutionary radiation of cells that differentiate into energy, information and reproductive forms, creating 'palingenetically' a new macro-organism. The why of those cycles and ages is simple: the mechanical, instinctive or organic will of all fractal beings that try to overcome extinction of its quantic time and quantic extension in space through the repetitive reproduction of its cycles and logic form in other place of the Universe and/or the creation of bigger MST fields, *through social, macro-organic evolution*, that will last longer in time and space. That Ternary Principle and the 3±st cycles of existence give birth to the feed-back, space-time field's generator, E⇔i, and its verbal expression: *'all what exists is a cycle of energy and information transforming into each other.'* From where we can deduce all other equations of science as specific combinations of different cycles of energy and information described by each equation.

When a decade ago I found that Generator equation of the Universe I thought on Einstein's sentence: 'I would like to know the thoughts of God, the rest are details'. And indeed, each science studies the details of those thoughts. But it is rather more important to understand and be guided by the essence, instead of letting the details to obscure the ultimate thought. And that essence is the concept of networks and systems and its laws that are common to all points of view. Since:

### *7. Networks control their cells; Gods exist in the higher plane of Space-Time.*

The mechanist emphasis on spatial, mathematical analyses also limits our understanding of the information networks, which rule any organic system. Since scientists, under the ideology of "naive realism", look for elementary, material, visual particles and continuous systems, missing the essence of fractal, invisible information, which is its speed, simultaneity of reach and minimal, broken patterns of size: You do not see the words that communicate human beings or the gravitational force that fixes you to the planet; yet both exist and without them History and Physics are meaningless.

So macro-organic systems, as anthills or civilizations that appear "disintegrated" because we do not see the pheromonal and verbal information that creates them, are not considered organisms. Instead, scientists consider more important the cellular, energetic, negative entropy that comes from the simpler social planes of an organism than those informative networks that create and integrate from the top the 'consciousness' of a hierarchical organism - when in fact most causes of reality go from the larger scales of the system, which changes the informative and energetic fields of the entire cellular mass, provoking according to the ternary principle and its laws the behavior of its microscopic parts. And so both, the parts and the whole come together to create an event or super-organism.

For example, the 3rd paradigm of measure tried to explain the psychological character of human beings only through chemical micro-genes. Yet in a human organism, both, hormones and electric impulses modify and control our organs, but because scientists have only decoded properly a few hormonal signals they tend to disregard the electric, nervous system, the higher plane of existence.

The same obsession for 'perceived' causes retarded the evolution of genetic for decades, till as we forecasted long ago and the science of evol-devol has recently discovered, the complex morphological characters of organisms are caused by groups of genetic characters that form together a 'higher', epigenetic system of information. On the other hand, scientists found that 99% of human genes are equal to those of the worm; *because individual chemical genes control biological functions common to all living beings, acting primarily in the biochemical level in which they exist.*

On the other hand, 'data-based' history explains all historical events departing from the actions of individuals. Yet, as Marx already understood with his concept of a historic superstructure, the future of history is caused by the structure and evolution of its 'physiological systems', the economic/energetic and cultural/political informative networks that shape societies. *Since any individual form is part of a higher plane of existence that controls it through its energy and information networks.*

Naïve Realism doesn't understand that information and languages are smaller, often invisible to our limited means of perception, despite controlling social cells and their energy. So it denies the collective consciousness and networks that define many organic systems.

For that reason scientists deny the existence of the Absolute God, the mind of the Universe (reduced to a mere set of mathematical laws) and the relative Gods of History, the collective, subconscious minds of cultures, born out of the fusion of many human minds that follow the same ethical-verbal, memetic behaviour. Yet if invisible gravitation attracts bodies and science recognizes it, so it should recognize also the collective subconscious minds of nations. Since their existence and mass-effect is evident in the sacrifices of individual 'patriots' and religious believers.

In fact, there are infinite relative, Aristotelian Gods, informative, focused minds that regulate and control the quantic micro-cells of its organism through 'invisible', ultra-fast informative networks or regulate the quantic lives of its ecosystems through general variations in their information and energy fields that affect those microscopic beings, extinguishing them or forcing them to reproduce or evolve in a certain morphological direction, according to the ternary law. Causality is multiple. It goes not only from the smallest scales to the biggest ones, from 0 to 10, from genes to organisms but also from 10 to 0, from brains to genes, from ecosystems to species. And finally, from 1 to 1, from species to species of the same plane existence, as sometimes genetic material is transferred across the same plane of existence.

Indeed, the key to understand Evolution is to introduce the simultaneous study of causes coming from all planes of existence. When an ecosystem changes, it extinguishes species that do not change as the ecosystem does. So the 'ecosystem', the bigger organic network, programs its micro-cells. In the same manner, a baby is born with neurons whose axons will be connected as experience and visual perception directs them. So the environment decides the logic connections of the mind. Once and again we observe that a micro-plane of existence only creates a blueprint that the 'macro system' sculptures and selects with its own organic laws of extinction, the chisel of the sculpture that gives us the final form. Since time rules, curves space and information rules energy in all scales of reality:

Thus, the black hole, the brain of the galaxy, regulates with invisible gravitational forces the orbits of its stars and uses them as a 'feeding mouth' that gathers its interstellar quantic, atomic food from space*).* In the lower scale stars control with "gravitational waves" the distance of its planets that control with its geologic and climatic changes of energy (temperature, orogeny, etc.) the evolution of living species like humanity (800 years cycles). On the other hand, the organic systems of humanity, civilizations, control men through its "often invisible" audio-visual, monetary and legal networks*;* and men control with nervous

networks its cells that control with genetic information their carbohydrate molecules that control with electromagnetic forces their atoms that control their electrons, that attract light that feeds on dark energy, the spatial body of the Universe. So the main flow *of causality begins in the biggest scales and concludes in the energy quanta of its lower scales.*

If we apply hierarchical causality to history, it is obvious that the only way human beings can control his future is by creating an international global, super-organism able to dominate the actions of individuals, machines and companies, the quantic cells of the economic ecosystem, based in the natural laws of social evolution and the memes of life and love of our biological language-network. Because…

### *8. Words are the social, temporal language of man., Mathematics perceive only space.*

Mathematical scientists despise verbal scientists because they think words are ambiguous and mathematics far more accurate. Yet in a probabilistic Universe where truths are relative, since we do not perceive all its information, words become the perfect language to portray those ambiguities, as they do when describing the will and 'future action paths' of human beings, in which often multiple points of view converge to obtain a final outcome that must be negotiated - while mathematics seem more accurate, because they reduce part of that information, eliminating it.

Unfortunately for mathematical physicists the Cartesian geometrical, origin of their models, downplays the importance of time and makes space the only reality: Time becomes one-dimensional and space steals an extra 'height dimension', proper of information. Even life, the most perfect form of information is defined by spatial science in terms of movement and energy; instead of being defined in terms of informative perception and intelligence, as old philosophers used to define it. The Universe loses its tempo-logical nature and becomes also a big-bang of spatial energy. Space, Energy and force, no longer time, information and perception, matters because the still, inner virtual worlds of Points with Parts have disappeared from the graphs of Cartesian scientists.

Spatial mathematics is more accurate when we apply them to simpler beings like atoms and forces, which have minimal form and maximum spatial energy. Further on, the limits of our perception due to the distance of atoms and stars, simplify their properties. So mathematical simplicity is better to describe astro-physical forms that seem mechanisms to us. But words are better to describe complex living forms and human beings, as Theory of Evolution, Philosophy, Social sciences and Eastern religions have proved. A sword is only a line and it seems perfect; so happens to the simple mathematical language we use to describe that sword. Yet a complex human being seems imperfect in numbers, because he is too complex to describe all its properties with them.

Eyes, mathematics and numbers perceive geometrical space; while verbal words and sounds talk about events in time. So mathematics is basically a spatial language, while words are used to measure temporal phenomena; and since information dominates energy words are the fundamental language to explain informative, temporal species, such as life is. For that reason, because we are living beings, Theory of Evolution is the most important classic Theory of knowledge. And it includes Economics, which is today dominated by the evolution of machines by its company-mothers – a theory so self-evident and accurate calculating the future, as the work of this author that forecasted the present crisis and its dates 20 years ago has proved[1]. On the other hand financial economists have never been able to predict the future of its indicators – it is in fact the only science that has never been able to do so, to the point that The Economist conducted a poll of future indicators won first by taxi drivers, then garbage collectors, next finance ministers and finally in the last position, economists. And despite of it, according to polls, 76% of economists think their discipline is the most 'scientific' of all social disciplines, because it quantifies its propositions, when it cannot even define what an economic ecosystem i*s*.

And what the economic ecosystem is has become clear in this work: a system of metal-memes that is extinguishing life. Yet economics with its use of numbers without form hides the harmful collateral damages of machines. Classic economics with its definition of wealth in monetary

terms ignores its lethal purpose: to create a world to the image and likeness of the machine. Bio-History and bio-economics however by using the verbal language and theory of evolution is both more humane and more accurate as it has a positive purpose for mankind – to make a world to the image and likeness of our species. And so it should be considered the 'real model' of social sciences.

In that sense, mechanist Physics and financial Economics should be regarded as applied, technological sciences related to the evolution of machines and become somehow downgraded in the Pantheon of knowledge, as secondary sciences, submissive to Biology and History - that study life and the human being; given the limits of physical perception, which make those AE-sciences useless to search for the ultimate laws of reality and its biased 'biological purpose', which despises man and its senses and considers its goal to evolve and reproduce machines. And for the same reason budgets to make electronic machines and physical experiments should be judged, as those of all applied sciences, according to its utility for human survival, banning them when they might have negative side effects on mankind, ignoring the 'excuse' of metric measure as the supreme knowledge. We thus conclude that:

*9. In a diffeomorphic Universe man and his languages should 'be the measure of all things'.*

It is evident that mathematical, abstract science, as anthropomorphic religions did before her, has set the pre-conditions to perceive a dead Universe with man as its only intelligent being in its center. This is natural to the Galilean paradox. Since numbers simplify and "itify" reality, emptying it of virtual worlds.

Yet when we apply mathematics to human beings in statistics and economic equations of productivity that equal men and machines through prices, they become a lethal weapon that makes of man just another abstract point-number. This explains why the 2 leading technological, scientific nations of the XX century, pre-war Germany and modern America, show an appalling lack of concern for human rights. It is necessary to know and explain those limits of mathematics, especially in the study of social sciences. Otherwise economists will eliminate man from the economic ecosystem, as we are, from an abstract point of view, less efficient than robots with which they compare us through abstract prices and productivity-costs. Since mathematics is a language that equals all beings through equations: X=Y. So when those equations are applied to man, man is equalled to an object, a price or a machine in "economic" equations of the type*: Man =Price= Object*. Thus economists treat man as an object and eliminate 'it' with equations of productivity, substituted by robotic machines or killed as collateral damages in profit wars. Since an object of higher price, often a weapon, matters more.

The moral error of mechanist science that measures and extinguishes life ignores 'the subjective laws of survival'; which should dominate our societies. Tagged and measured, man stops being the subjective center of his own Universe, becoming an object, a commodity. Yet in verbal languages this never happens. Since man is always the subject, center of the verbal action and therefore, words value humans more than any object: *Subject > Verb > Object.* Since man, the subject dominates the object through the verb. So 'he' cannot be an object. He can't be priced. Man and life become bio-ethic concepts that cannot be expressed in digital numbers. The logic of survival is not the abstract logic of mathematics, but the bioethical logic of words that should guide humanity in our search of knowledge and happiness. Because in an organic Universe of multiple languages and dark spaces, where information is always a linguistic subjective truth, the only truth that matters is survival. So:

"*Man should be the measure of all things".*

That human extinction is not certain, is obvious. Yet even mechanist scientists making electronic gadgets use probabilities in quantic physics as a way to reach truths that work. For the same reason, if there is a probability that CERN's black hole factories, nanorobotics, (metal-bacteria) and robotics can extinguish mankind, making us obsolete in labor and war fields, the creation of robots should be forbidden as a criminal act against mankind. What digital scientists forget though, is that they can also be substituted; that *an extinct scientist knows nothing.* In that sense, this work does not affirm to have the absolute truth but

the most probable truth about time, with a clear aim: to help man survive into the future. Within the limits of languages, absolute certainty is impossible. Thus probable truths guide all beings, since survival is a game of probabilities not of certainties. For that reason we should limit all probabilities of human extinction, controlling its possible technological causes, prohibiting robots, weapons and scientific ideologies, such as capitalism, mechanism and nationalism that foster the destruction of man by machines or by other men.

The language not the body, information not energy, determines the survival of any species into the future, also in history, because the species, which better speak the languages of an ecosystem creates the future. For that reason, when man loses his verbal language, degraded and despised today as a form of dramatic fiction of null logical value, or substituted by digital numbers spoken better by machines, humanity loses his future and becomes obsolete to the digital machines of information we worship.

Since all species of the Universe display the same formal, organic structure and obey the same MST laws, it is evident that by studying man, the species we can observe in more detail, 'as the measure of all things', we can understand the laws of the Universe better than by analysing atoms or stars. Hence, Biology, Medicine, and Bio-History that describe human beings at micro-cosmic, individual and macro-organic level, should be, from the point of view of MST theory, the 3 fundamental disciplines of knowledge in a better educational system, where Bioethics, the science of survival becomes the guidance of politicians and economists and MST theory, the science that explains the relationship between parts and wholes, points and networks, becomes the philosophy of all sciences, the thoughts of God. Since:

$$10=1_{st+1}: \textit{We are all parts of the Eternal Whole=God}.$$

The 'relative immortality' of the fractal space-time Universe is possible because of the co-existence of many quantic time/spaces that evolve or devolve, live and die in each local region of the Universe. Thus the sum of all beings that expand and die, all beings that reproduce and repeat its form and all beings that contract and inform reality, creates altogether a dynamic balance that makes reality an eternal present of 'quantic' fluctuations called lives. Thus the Game of Existence, the 'Mind of the Universe' is constructed to be eternal without being dead, thanks to the infinite minute lives and deaths of all its beings. In order to live, to perceive, we need to absorb the energy of other beings that have to die. It is the law of survival, the cruellest law of the existential game:

*Life (perception) =Death (energy explosion), Victim (energy) =predator (form)*

The fight between species is unavoidable: All energy dies, because a living being absorbs it. And thus the balance is re-established. In mathematical terms we can say 'that the total wave of energy of the Universe' cancels with 'the total wave of information' in all and each one of the events of the Game of Existence. No matter how much a being wishes immortality, the existential game does not allow it. Because only the Game is immortal. Yet it is also just, since we die because we kill, we become old and suffer because we were young and had pleasure…

For that reason, we postulate an infinite, quantic Universe, body of an eternal God, which is an impersonal set of rules, we call the '*Game of Existence'*, that as its name implies, *exists* forever in time and it is immutable in space, although it contracts and dilates into many quantic, Existential Waves that ignite, flare and extinguish living beings. Ultimately because the Universe is a game of yin=information and yang=energy, with opposite properties, of God, the Game of Existence is paradoxical:

God is absolutely selfish (as we die for the Game to play again); yet he is absolutely generous (as each of its quantic parts gives its energy to feed other beings). He is absolutely just (as all what kills dies, all the pleasures of the energetic youth become the pains of the old, informative age) and yet he is absolutely cruel (as he gives us first the pleasure of life to take it away at the end). He is absolutely smart (as he has devised the best of games to be immortal) and yet He is absolutely dumb (as he was unable to invent a Game that had no suffering, no death). He is absolutely ubiquitous (as his consciousness occupies the entire Universe and beyond) yet He is absolutely diminutive (as its

quantic mind is a relative zero that perceive the infinite space). He is absolute eternal (as the game will never stop) and yet an ever fleeting presence (as his parts live so short). He is, in Words of Cusa, the minimum (the smallest particle of the purest information) and the maximum (the infinite Universe of absolute spatial extension). But overall he is the Supreme Dictator, Creator and Destroyer of all his forms, which are only a reflection of the Game. So we better watch out and respect his laws, because he is absolutely merciless, as any form that disobeys the laws of existence becomes extinct. And we are not respecting any of them… Instead, we have invented false Go(l)ds, selfish idols of metal to cater our arrogance. And so we will be absolutely extinct by them. Vanitas vanitatum et omnia vanitates. As we indeed are a zero mind that thought to be the center of the infinite Universe:

*$0_{0...}$ And the absolute nothingness of Man*

The importance for the praxis of life of knowing the true laws of the universe cannot be stressed enough. The immediate consequences are a cautious, humble, grateful desire to survive, which today humans lack. Arrogance and ignorance of the true meaning of time, life and its arrows of social evolution and organic life is the trademark of mechanist scientists, physicists and economists, the scientists of weapons and go(l)d that are destroying the planet. But they are 'experts' in their job. In true form, in the same way the culture of economists have been tailored to follow a series of myths that cater to their religion of power, go(l)d; physicists, the mechanists that construct the machines of our world, have built a series of myths about the 'mechanist' nature of the Universe, which cater to their use of machines as their tool of power. The machine, thus, becomes the idol of their/our civilization, and for that reason, we shall all die for the Large Hadron Collider, the last and most perfect weapon or for the profits of the Robotic Industry and the corporations that expel human workers… all those facts are product of our worship of machines of measure, more than the mind, intelligence and life of mankind.

The only penalty the Game has to those who do not respect its rules is the inversion of existence, the zeroes of all its quantic parts. Because all forms can also be destroyed and 'reabsorbed' by the eternal present; since when we fusion forms with opposite parameters of space-time together they 'cancel each other' into the eternal 'present' of virtual reality from where all is born and all returns. The Universe is immortal because it is virtual, as the sum of all its quantic, positive and negative space-time dimensions, dual a ternary differentiations is 0. Nothing happens as all what happens provokes its anti-event. Imagine the Universe as an immense n-dimensional volume of amorphous continuous energy in which information quantizes forms with very thin, almost invisible borders that appear and disappear constantly. Yet the entire volume doesn't change; it is eternal, never wears. Because if we create a convex line of time we are also creating a concave line on the other side, if we observe an infinite we do so from our 0. Thus all remains constant. Nothing really exists. All comes from a zero-point and returns to a zero-point. All is virtual for the whole to be eternal:

*Dust of space-time you are and dust you will become.*

The cycle is completed: our conclusions in the third age of science are similar to those of the Verbal masters of relativistic Eastern thought. Man should understand the laws of change in the universe, the existence of other parallel Brains, who perceive other regions of space and time, that man ignore. Then we should draw obvious laws of human behavior, according to those universal laws, and promote our role as top predator brains on Earth. We should not act with arrogance, and destroy nature - our biologic ecosystem - and pretend to be God, building machines more intelligent than us. Instead, we should respect the laws of evolution, use them to the advantage of man, and develop a harmonic vision of the universe, with both verbal and mathematical languages.

*Recap*. It is necessary to speak loud on the extinction of life by machines that poison this planet, destroy human cultures and will 'probably' extinguish us this millennium, unless we reform the scientific method and the postulates of economic growth based in technology, not in the human senses and the production of human goods necessary to our survival. But to achieve that, we have to accept again the supremacy of ethical-verbal-temporal languages, the laws of social evolution and love, the equality of all human beings and exercise a human, ethic supremacy over the machines of science. A Decalogue of Laws to awaken man to the vitality of the Universe might change the

cynicism of some techno-utopian scientists that deny ethics or do not want to control their machines. The 'third age of science' implies the knowledge of the living Universe, and the need to be cautious in that Universe, and use the bio-logic rules of existence to the advantage of man. It implies to deny the dogmas and lies of the scientific method, and substitute it for a superior method of knowledge and survival, as the scientific method substituted centuries ago the myths and beliefs of anthropocentric religions. It is the old vision of Chinese Taoists. Lao-tse said: when more complex instruments men discover, more wars and destruction happens.

**Notes.**

[0] ' Zeit ist das, was man an der Uhr abliest.'

[1] 'Harmonices Mundi' (1618).

[2] In an attempt to realize Leibniz's ideas for a language of thought and rational calculus, Frege developed a logic notation as the foundation of mathematical reasoning. Though this notation was first outlined in his Begriffsschrift (1879), the most mature statement of Frege's system is 'Grundgesetze der Arithmetik' (1893/1903).

In 1931 Kurt Gödel demonstrated in his paper On Formally Undecidable Propositions that within any given branch of mathematics, there would always be some propositions that couldn't be proven either true or false using the rules and axioms ... of that mathematical branch itself. You might be able to prove every conceivable statement about numbers within a system by going outside the system in order to come up with new rules and axioms, but by doing so you'll only create a larger system with its own unprovable statements. The implication is that all logical system of any complexity are, by definition, incomplete; each of them contains, at any given time, more true statements than it can possibly prove according to its own defining set of rules.

[3] Summa Theologica.

[4] The influence of religious beliefs in the ideas of the first philosophers of science is hardly recognized, except in the work of Thomas Kuhn. For example, Newton dedicated most of his work-hours to alchemy and Biblical studies, and believed God sent to him comets as personal messages. Only such beliefs explain the obvious contradictions between reason and the mechanist, monist philosophies of reality sponsored still today by many scientists. Since a mechanical version of the Universe as a series of clock-like cycles, which particles and entities do not command, but obey blindly, requires a creator - the 'clock-maker' of Newton and Kepler, who puts the cosmos on track - as Leibniz, precursor of rational organic theories explains in a letter to Clarke: 'Sir Issac Newton and his followers also have a very odd opinion concerning the work of God. According to them God Almighty needs to wind up his watch from time to time'; probably referring to Newton's Optiks, p. 402, in which Newton, aware of certain irregularities in the orbital paths, latter resolved by Einstein, affirms that those regularities will increase 'till the system wants a reformation'. Yet rational science should exclude any external, mythic agent to put it on track.

[5] 'The universe - said also J. B. S. Haldane - is not only queerer than we suppose, but queerer than we can suppose.' One of the queerest things about it is that its properties at the very largest scales--galactic super clusters--are very intimately related to those at the very smallest--subatomic particles. The big and the small are related; because they are indeed, self-similar fractal structures, whose energetic and informative properties have transcended through multiple scales of size, emerging again in the macrocosms.

[6] Mircea Eliade in 'History of Religious Beliefs' shows how pervading was in classic pre-Christian cultures the concept of a God of Time, (Zurvan in Zoroastrism), who lives through 3 ages, and the belief in a Universe made of Time, in which space is a Maya of the senses (Vedas, Buddhism).

[7] Letter to Besso's wife.

[8] 'Syntactic structures' 1957.

[9] The Holographic principle is explained in physics only for the limited case of the surface of black holes. It is however a general feature of all systems of information, which this author has used in all disciplines – from biological analysis of cellular functions to the study of form in art theory and bidimensional painting.

[10] Letters to Clarke (1715-16).

[11] A mathematical proof of its equivalence with information, extracted from Einstein's equations is:

$$E=mc^2 + E\ x\ T=k \rightarrow Mc^2 = k/T \rightarrow M= (k/c^2)x(1/T) \rightarrow M=K\ x\ v$$

Where v is the frequency of a mass as a vortex of space-time.

[12] Einstein could only apply the 5th postulate of Non-Euclidean geometry to describe gravitational space-time. Today, thanks to the discovery of the other 4 postulates of Non-Euclidean Geometry, which I introduced to the world of science in the 50th anniversary of Complex Sciences at the Sonoma Congress, the complex structure of Space, created by the interaction of Euclidean light-space and Non-Euclidean Gravitational space, can be resolved to explain many pending questions of astrophysics – from the nature of dark matter to big bang theory.

[13] Relativists model the Universe with Einstein-Walker equations in which each galaxy is treated as a hydrogen atom. This theoretical trick that

facilitates the calculus of relativity shows the self-similarity between a hydrogen atom and a Galaxy of the upper scale. Scientists also use models of electronic nebulae to describe the behavior of stars around the central black hole; and some have tried models with high-density photons. Yet self-similarity is not identity. So quantum cosmology, which uses quantum equations to describe the macrocosms as if it was identical to the quantum world, makes no sense. Instead we must observe the self-similarities of those scales, caused by the emergence of fractal parts into wholes. Can we know if those scales of relative size are infinite? Not really, because if there is a higher fractal scale and galaxies are self-similar to atoms, the extension of the cosmos will be so vast that we shall never find its limits. Indeed, in our Universe there are trillions of atoms. So even if there are trillions of self-similar atomic galaxies, the maximal perception we can have is of a few billions, within the total cosmos.

[14] Schopenhauer's philosophy culminates 3 millennia of western tradition in dualist models of the Universe, with his analysis of a reality composed of ideas – the informative mappings of the human mind - and the will – the satisfaction of the human arrows of time, our desire for energy, form and reproduction. While the idea has its site in the brain, the will has its point of maximal force, according to Schopenhauer, in the penis, whose pure desire of reproduction, guides in this philosophy of action, as the ultimate goal of existence, the world of the mind. Thus, for Schopenhauer – and we agree – the arrow of reproduction dominates the arrow of information.

[15] In his thesis, 'On the Hypotheses which Lie at the Foundations of Geometry', 1854, Riemann defined space in terms of motions and self-similarity, setting the basis for the advances of Fractal, Non-Euclidean geometries, formalized in the 70s and 90s by Mandelbrot ('Fractals', 1976) and completed by this author with his definition of the fractal point and the 4 remaining non-Euclidean postulates ('Radiations of space-time', 94; ISSS, Sonoma, 2006.)

[16] This work resumes 20 years of research in System sciences and its multiple disciplines: non-Euclidean geometry, fractal mathematics, duality, complex logic, complex biology, complex physics, complex history, etc. It is part of the 9 conferences which I will give at the International Systems Societies, during my tenure of the SIG of duality in the congresses of Cancun, Sonoma, Tokyo, Madison and Waterloo (2005-2010), to complete an overview of what I call the '3rd age of science' when Man will learn he exi=sts within a self-similar, organic, eternal Universe of 2 fractal, scalar, self-generative, i-logic motions - energy & information: $\sum e \Leftrightarrow i$.

Modern scientific Duality is a relative new science, whose formalisms and main laws were systematized in my book 'The cycles of Time', c. 94 (Spanish edition). Yet prior to this work, there has been an enormous quantity of laws, data and 'similarities' between all the species of the Universe (called isomorphisms and other technical names in our science) found during 50 years of studies by System and complexity scientists. Santa Fe Institute of Complexity and Len Troncale from Pomona University have done important work classifying those isomorphisms. While an array of specialists in system sciences and complexity, from Rossler to Capra, from Prigogine to Miller, and the founding fathers at Macy's, Bertalanffy and Norbert Wiener, provided many of the theories and logic and mathematical insights required for the consistency of a Theory of Multiple Spaces-Times. The complete development of such theory would require though the rewriting of the entire 'Encyclopedia of human knowledge', since we contend all can be explained with those 4 drives of 'exi=stence'.