FROM EPISTEMOLOGICAL CAGES TO TRANSDISCIPLINARITY AS OPEN SYSTEM OF KNOWLEDGE

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I am candid in my message *-- ethics is what we need --* ***and didactic in my style*** *-- every individual, the simple or the sophisticated intellectual, carries the responsibility and the means to direct her/his energy to socially constructive ends.*

The state of the world is disturbing. The disenchantment with the course civilization is taking leads to question the prevailing systems of knowledge in all its modalities, religious, socio-political, economic, historical and even scientific, which does not mean retrogress, but it is a coherent response to the state of society. To question needs to analyze, in a historical perspective, the full cycle of knowledge, that is, its generation, individual and social organization, transmission and diffusion, as well as its expropriation by power structures. This analysis is possible only if we free ourselves from the epistemological biases that are adopted to justify the prevailing systems of knowledge, which is identified with Modern Civilization.

The supporting values of the prevailing systems of knowledge are, essentially, rigor in the discourse, precision in time and space, increasingly strict *etiquette,* codes, and social stratification. These categories of support, called paradigms, are exclusive.

Globalization offers an example of the universal acceptance of the paradigms of Modern Civilization. Let us look into the accepted concepts of time and space, which are the strictest categories. Time is regulated by the Greenwich standard, which is universally accepted. Space is regulated by international accepted national boundaries, and each nation is governed according to constitutional norms. Every country honors international IDs, such as passports, and controls their space through visas. In communities, door keys and lockers keep daily privacy and property. Although executive, legislative and judiciary systems are the responsibility of nations, part of national constitutions, bilateral and multilateral treaties are responsible for legislating transnational activities. Supranational organizations the United Nations, and its specialized agencies, provides international cooperation and mutual respect among nations. Also, it is increasing the number of NGO/Non-Governmental Organizations, of transnational character, in several countries.

Systems of knowledge, in different modalities, are organized as disciplines, which are subjected by epistemologies, consisting in specific objectives and methods, supported by criteria of truth, rigor and precision, and anchored in normative specificities, such as systems of codes and language, normally incorporating specific jargon.

The organization of knowledge as disciplines, with these rigid delimitations, flourished after Renaissance, and prevails until nowadays. Disciplines are closed in their methods and objects, in their discourse, precision in time and space, increasingly strict *etiquette,* codes, and social stratification.

Knowledge, behavior and systems of values have specific objectives and are supported and rely on rules, on written or unwritten traditions, on codes and styles of discourse and on specific jargon, and are validated by criteria of truth, of precision and of rigor. These categories and validation are exclusive for domains of knowledge, which are the disciplines.

Some years ago, I have introduced a metaphor, the epistemological cages, as the habitat of disciplines. It is not possible to leave the cage. The advancement of knowledge and the search for new knowledge is limited to what is inside the cage, subordinated to the specific epistemology. As a figurative saying, it is not possible to see the color of the external painting of the cage.

Following this metaphor, I consider disciplines as "encaged" knowledge. Methods and results are specific to deal with well-defined questions. The juxtaposition of

epistemological cages is a metaphor for multidisciplines, metaphorically as neighbors. Opening a door of communication between the cages is the metaphor for interdisciplines, which is equivalent to inserting cages in a larger cage This allows to consider objectives and methods common to both, as well as accepting accorded criteria of truth, rigor and precision, and normative specificities, such as systems of codes and language, and even a common jargon. It is similar to a larger cage, an "aviary".

In these expansions, from disciplines to multidisciplines to interdisciplines, the metaphorical image is the same: inquiry is limited to what is inside, the methods are limited by the wires. The results tell nothing of what is going on outside.

The proposal of transdisciplinarity is the freedom to leave and return to the cages. It is not a proposal for abolishing the cages, but for abolishing the exclusivity of specific cage to face situations and problems. Transdisciplinarity is an open system of knowledge, of inquiry and of search. This implies a necessary to relax specific objectives and the supporting categories and criteria of validation. Precision and rigor are subjected to openness, coherence and respect. Inevitably, fuzziness prevails.

On systems of knowledge

I will discuss how my ideas on systems of knowledge an evolution from a disciplinarian approach to a transdisciplinarian one.

Historically, disciplines were created as a method to reach knowledge. Soon, this approach was recognized as insufficient. Intents to put together disciplines to face a complex question or problem were common in the 17th century. The idea was that more disciplines one knows, higher are the chances to better understand. The juxtaposition of results is called multidisciplinarity, which was soon incorporated in school systems. Curricula, even nowadays, are essentially multidisciplinarian.

Next step, interdisciplinarity, not only juxtaposes results, but combines methods, which implies the identification of new objects of inquiry. This was typical in the scientific production of the 19th century.

Interdisciplinarity gave rise to new areas of knowledge, such as, for example, electromagnetism, thermodynamics, neuro-physiology, physico-chemistry, quantum mechanics. These areas, typically interdisciplinarian, later defined their specific objects of study and their methods. Indeed, they became new disciplines.

With the invention of new and more sophisticated instruments of observation and analysis, which became intense in the 20th century, the interdisciplinarian approach, as well as the intercultural, became insufficient. The quest for total knowledge and for a planetary culture asks for a transdisciplinarian and transcultural approach.

In order to elaborate knowledge, it is essential the perception that man has of himself as:

- an individual reality, conscious of his sensorial, intuitive, emotional, rational dimensions;
- a social reality, recognizing the essentially of the other;
- a planetary reality, learning of his dependence on the natural and cultural heritage and conscious of his responsibilities in their preservation;
- a cosmic reality, assuming the drive to transcend space and time and his own existence, looking for explanations and historicity and designs for the future.

The transdisciplinarian approach relies on mastering, necessarily in an integrated way, several disciplinarian areas, ranging from cognitive sciences to epistemology, history, politics, and several other theoretical reflections of interdisciplinarian nature.

I see transdisciplinarity as a research program focusing

- the generation and production of knowledge,
- its intellectual organization,
- its social organization,
- its diffusion,

all treated in an integrated form.

The critique of disciplinarian knowledge has been frequently austere. Some critics even refer to a fictitious character of modern science itself, which is the reflection, supported by historical views, of an ideology.

The consequences of the great navigations and discoveries of the 16th century, namely conquest, modern science, colonial empires, technology and the problems generally referred to as underdevelopment, are indicators of an undisguised ideological posture, which subordinates the production of knowledge. This affects the peripheral nations, particularly regarding scientific and technological production, hence what is considered development.

We now notice the emergence of historiographical proposals, which try to escape from these views, opening new possibilities for the production of scientific knowledge

which favor regional needs. An holistic approach to historiography, which grows in importance, asks for a critical analysis of the generation and production of knowledge, of its intellectual and social organization, and of its diffusion. In the disciplinarian approach, these analyses are unrelated, subordinated to epistemological cages, mutually exclusive, which define specific areas of knowledge, mainly cognitive sciences, epistemology, history, politics, education, communication. Each is the object of a specific department in the usual academic structure!

When we refer to History of Knowledge, we are meaning the history of the species and of its habitat in the broad sense, indeed the history of the planet Earth and of the Cosmos. But it is not possible to understand the history of the Earth and of the Cosmos without taking into consideration the views of the Earth and of the Cosmos created by man himself. Modern science, when proposing "final theories", understood as definitive explanations for the origin and evolution of nature, stumbles on a posture of arrogance.

Transdisciplinarity, by rejecting the posture of arrogance associated with the belief in a supposedly absolute knowledge and adopting the humbleness of relentless quest, calls for respect, solidarity and cooperation in the knowledge-producing enterprise.

Setting the ground

In every living species, the generation of knowledge and of behavior is individual. Knowledge and behavior interact, as if in a symbiotic relation. The human species developed a very sophisticated form of communication, which allows knowledge to be shared and behavior to become compatible. Through encounters and communication, common knowledge and compatible behavior of a group develops into what is called **culture**. Values are associated with the way individual and groups behave as a result of their knowledge, and are implicit in the common knowledge and compatible behavior of the group. Hence, values are cultural.

Culture is transmitted both in space and time through encounters and communication. To develop values we need to understand the dynamics of this transmission. But culture, the same as life, is not static. It is in permanent change, through inter and intra-cultural evolution. Hence, culture is transformed and, as a consequence, values change.

In human history, there is an evolution of encounters, from walking to space travel, and of communication, from talking to internet. This evolution sets the scenario for some reflections on the dynamics of cultural transmission in the present and the

possibilities for the future. This dynamics is affected by education. Values are a result of this dynamics.

We need a dramatic change in the foundation of our civilization. Social norms and values associated with systems of wealth creation and of work, which are based on win/lose and scarcity/abundance aims, are unsustainable. We need an ethics, focusing on the shift from competition to collaboration, from human separation to human interconnectedness, from human dependence to human interdependence, from fear to love. This shift will be the most significant change in all of human history and the beginning of a journey in the direction of a planetary civilization.

This can be facilitated and supported by advances in communication and information technologies, which serve the purpose of connecting humanity. We are approaching a breakpoint in human history, with the possibility of creating a new civilization.

While this paper carries a message of hope for the future of mankind, we must point to the dangers facing nature, mankind in particular. There is a threat of extinction of civilization.

It is a fact that in the very short span of his presence in the planet, man became marveled to find himself as the focus of a process, but, at the same time, is threatened by extinction. Environmental decay, greed and violence are but a few indicators of the road to extinction.

The economic structure supporting current style of life is clearly unsustainable. Indicators of this are the inequity of living conditions, which manifests in increasing poverty, both internally in every country and among nations, the unrelated goals of production and consumption, causing unmanageable waste, and the fragility of the economy. Short sighted policies of the most powerful nations in adopting environmental protection measures, such as the Kyoto protocol, and of supporting peace moves, such as an anti-ballistic missile treaty, are indicators of irresponsibility in dealing with the state of the world and with the legacy of this generation.

Public services, inclusive education, health, transportation and energy, are increasingly in the hands of corporations. About 20 years ago I commented on protest groups like *Greenpeace* [1], ATTAC/*Association pour la taxation des transactions financières pour l'aide aux citoyens* [2] and others non-governmental organizations, defy established governments. Today we have *Anonymous* [3]. There are even signs of the emergence of parallel governance. These actions groups and the reactions by the power structure generate violence which plague the relations in families, schools, communities, states and nations. Violence, instead of dialogue, has been the option. Mounting violence is a no-end perspective.

The only possibility of escaping extinction of civilization is to achieve **peace** in its broadest meaning:

- inner peace
- social peace
- environmental peace
- military peace

What is peace? Putting it in the simplest terms, peace is the capability of dealing with conflicts [which are unavoidable as a result of individual differences] without the resource to arrogance and to bigotry, which culminations in aggression and violent confrontation.

The only road to peace is through **dialogue**, based on a global understanding of the phenomenon life, which implies the recognition of differences. This dialogue, usually undertaken in an intra-cultural scenario, must be not only inter-cultural, but indeed adopt a transcultural strategy. Dialogue is, basically, the attempt to understand the other, recognizing that the other does not have the basic understanding as I have. Transcultural dialogue, which crosses time and places or positions, must be the characteristic of the new encounter.

It is interesting to observe how the concept of life evolved with the evolution of knowledge. I use the example of three encyclopedias.

In Isidore of Seville's (*ca*.560-636) on *Man and Monsters,* we read:

> "Life, *vita*, is named because of vigor, or because it holds the power of being born and of increasing. Whence also trees are said to have life, because they spring up and grow."[4]

Birth and death are the boundaries of life. But much later, in the Modern Era, the *Encyclopædia Britannica*, 1771, states

> "LIFE, is peculiarly used to denote the animated state of living creatures, or the time that the union of soul and body lasts."

We see an explicit recognition of the duality of body and soul, or mind and matter. In current days, *The New Shorter Oxford English Dictionary on Historical Principles* explain, as the first meaning among many others, that

> "life. The condition, quality, or fact of being a living organism; the condition that characterizes animals and plants (when alive) and distinguishes them from inanimate matter, being marked by a capacity for growth and development and by continued functional activity; the activities and phenomena by which this is manifested."

In all these conceptualizations of life, the concern is with the individual and life is bounded, limited in time. In technical terms, we might say that life is something capable of reproducing itself, capable of adapting to an environment and also capable of independent actions not decided by some exterior agent. Life is most generally carbon based, indeed a complex combination of commonly found atoms.

I prefer to describe life, in a single word, as continuity, understood as survival of the individual and of the species. In the encounter oneself recognizes the other, the different, recognizes the essentiality of the other, and recognizes the mutual dependence, of oneself and the other, on nature, as the support of life. This leads to a primordial behavior, which calls for continuity of life, in its broadest sense. This primordial behavior I call the **ethics of diversity**:

- respect for the other with all the differences;
- solidarity with the other in the satisfaction of all its needs;
- collaboration with the other in preserving the support for life.

Different than systems of values, this ethics precedes any notion of culture. Indeed, it is transcultural.

The **pulsion of survival** generates the need for coping with the environment, the search for explanations and the curiosity of understanding.[5] A consequence is the idealization of superior beings responsible for reality [creators], with unlimited knowledge and authority [omnipotent]. To please or displease the superior beings imply reward or punishment, in the reality of life and after life. To be favored by the superior beings becomes a goal. To please or displease the favorites of the supreme beings can be equally rewarded or punished. Religion and religious practices, accompanied by art and systems of symbols, paves the way for complex societal organizations. Power, which in the animal kingdom is associated with survival of the individual and continuity of the species, becomes associated with the will of superior beings.

Going deep in the search for explanations and for understanding and the urge to cope with the environment, leads to systems of knowledge, which incorporate the belief in creation and cosmic order. Thus, myths become instruments of power.

The era that we call civilization started only around 10,000 years ago, with the emergence of agriculture and urbanization. This made it necessary the development of different forms of knowledge. Knowledge has been and continues to be employed for maintaining and improving the evolvement of different models of social organization which support different production systems.

With the impressive emergence of the civilizations of Antiquity, in different parts of the world, the encounters became strategies for claiming prevalence of one system over others.[6] With the emergence of Christian and Islamic faiths, religious conversion became the main support of the prevalence. The great navigations, the colonial era, and the post-colonial globalizing expansionism, euphemistically labeled the free market era, all have been supported by principles and theories, coherently structured.

In a intriguing essay, Peter Raine sees globalization as revealing two sides:

> "Firstly the deleterious impact of technological and economic development' on the Earth's living systems (*i.e.*, the environmental crisis), and secondly the increasing demand of indigenous and autochthonous peoples to express their own unique claim to a coherent, intelligible, and equally valid worldview. These people not only wish to guard their own Earth, but also to guard it from the actions of people who belong to the predominant Western worldview. That technology, science, materialism, and even rationality may be rejected by some, comes as a surprise to many modern people, especially those who are wholly convinced that theirs is the only way to apprehend reality." [7]

A model of rationalism provides this conviction. Identified with objectivity, its validity is frequently assured by theories subordinated to a decided logic and anchored in experimentation. On the other hand, traditions are based on experiences, which are often referred to as subjective knowledge. The major conflict occurring in modern thought is a seemingly irreconcilable feud between practitioners supported by experimentation and those supported by experience.

Experimentation, identified with science, is necessarily linear and ideologically loaded. The aim of experimentation is to consolidate accepted knowledge, and it implies a preponderance of the experimenter over the subject of experimentation. Experimentation is arrogant.

On the other hand, experience, identified with the traditions, comes as a mutual respect and interaction of the observer and the observed, and is necessarily non-linear. The observed reveals itself. Experience is humble.

The crux for a viable future is the capability of conciliating these two views, science and traditions. I do not agree with the option of "a third culture", in the sense used by C.P.Snow in the revised edition of his classic.[8] It is not a matter of opening communication between scientists and humanists, but rather of making both, scientists and humanists, aware of the totality of phenomena. To bridge the gap it is necessary to overcome the usual prejudice generated in the intracultural dialogue, which is impregnated by arrogance. But it is not enough to reach an inter-cultural dialogue. We must go even further, aiming at the transcultural dialogue. The eminent physicist Murray Gell-Mann says:

> "Unfortunately, there are people in the arts and humanities - conceivably, even some in the social sciences who are proud of knowing very little about science and technology, or about mathematics. The opposite phenomenon is very rare. You may occasionally find a scientist who is ignorant of Shakespeare, but you will never find a scientist who is *proud* of being ignorant of Shakespeare."(underline is mine) [9]

The key point is the meaning of knowing. Indeed, without much more than a proficiency in common English and some sensibility, every one can follow Shakespeare's arguments. But it is hard to follow the arguments of scientists. Their language is more like a jargon. Claiming that it must be rigorous and precise, it is hermetic. Thus my reference to epistemological cages, as explained in the beginning of this paper. To popularize science is still regarded with disdain. But some scientists challenge the scientific establishment and try to reach a larger public. It is possible that the insistence of Galileo writing in Italian played a role in his process. When Newton wrote the accessible *Opticks* (1704), his theories were embraced by artists. Sigmund Freud and Albert Einstein became household names and quantum theory captured the imagination of every sector of the academia. Gödel's ideas, once translated into common language, were immediately incorporated by mystical thinkers and social scientists. All these examples met with the arrogant disapproval of a very large part of the community of mathematicians and physicists, who insisted in the exclusivity of the epistemological cages.[10]

The internal conflicts in the academic community continues. The renowned astrophysicist Halton Arp describes the attempts to publish a book in which he challenges current theories of the origin of the universe. In the book, Arp denounces the fact that scientific discoveries which challenge the truth of accepted knowledge, are rejected, even ridiculed by the established academia.[11]

The meaning of knowing has much to do with the meaning of "for all", to which I referred in the caption of this paper. The key issue is the acceptance of non-privileged

access to knowledge. This meets the barrier of the language inbuilt in the structured organization of knowledge, which mystifies basic ideas.

This leads to discussions about the most basic and comprehensive knowledge, that is worldview, which is backed by *mythos* and *logos*. *Mythos* is the substratum of worldviews, out of which we try to explain reality. *Logos* is the system of arguments which "explain" the *mythos*. The interplay of *mythos* and *logos* is the history of the human species. These concepts are essential in the thinking of the theologician Raimon Panikkar, who claims that

> "*mythos* and *logos* are two human modes of awareness, irreducible one to the other, but equally inseparable."[12]

According to Raine,

> "Myth is a whole; it cannot be reduced to its parts. *Logos*, is the realm of the intellect: it is the reasonable, all that is thought and spoken of. *Logos* is the domain of the rational, the reasonable, and the communicable. *Logos* originates from the *mythos*, yet if a myth is rationalized or pierced by reason it ceases to be *mythos*. However, if a myth is recognized by *logos* it then becomes part of the intellectual realm and a new myth emerges to replace it."[13]

Education, particularly Science and Mathematics Education, must be radically changed to recognize this interplay, thus creating the conditions for a comprehensive view of the universe. I do not see as important what some people call "high quality science education", measured by standardized tests, and claiming goals of quality borrowed from industrial production. I mean an overall education, asking for a worldview and finding a meaning for the human presence in the world. What is the meaning of the human being being human? This word game synthesizes the great illness of mankind: the dichotomy of human being [substantive] and being human [verb]. The only way to eliminate this dichotomy is to revamp our educational curricula.

Great changes in education are now possible, thanks to splendid advances in the domain of communication and information theories and, what is even more impressive, by the emergence of artificial intelligence and automation.

These new fields of knowledge, which make possible the substitution of humans by all kinds of robots, have been conceived, designed and implemented by the big corporations, in order to consolidate perverse policies. Paradoxically, these same advances allow for bigger awareness of the worldwide situation. They offer enormous potential to find a way leading to a decent survival of our species.

Summarizing, the concept of knowledge is a crucial issue in defining human behavior.

KNOWLEDGE, BEHAVIOR AND SURVIVAL.

To talk about human behavior we have to understand the phenomenon life. Life is action performed by the individual in and into reality, an action which follows a strategy, designed by the individual himself, after processing information from reality.[14]

To be part of reality implies interaction and participation, which result of processing information. This is the essence of free intelligent behavior, which characterizes our species and which defines our existence. One exists in the measure that one reacts to information from reality and processes this information in order to define strategies for action upon reality.

Since the primordial event in the history of the Cosmos, probably $14x10^{12}$ ago, reality stands for totality. Life comes relatively late, about $4x10^{9}$ years ago, and, to the best of our knowledge, only in a diminutive part of the Cosmos, our planet Earth. Since then, it has manifested itself as phenomena of various kinds, and more than 2 billion species have evolved.

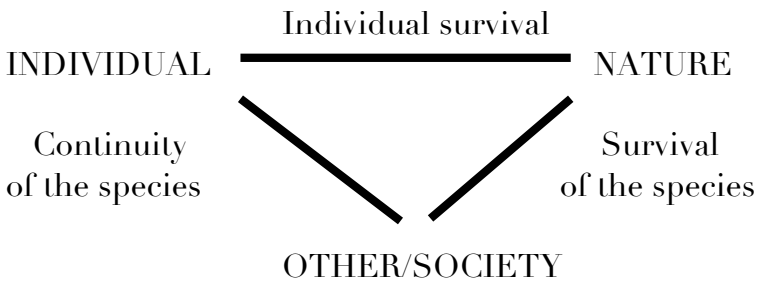
The dynamics of life is the dynamics of the process

...REALITY --> INDIVIDUAL --> ACTION --> REALITY --> ...

and all living beings are subjected to it. And, thanks to it, all living beings are responsible for modifying reality. To what extent? Individuals interact and organize in societies. In which way?

It is estimated that between 5 and 30 million species live now on the Earth, classified in kingdoms: *Monera* [blue-green algae, bacteria], *Protista* [protozoa], *Fungi* [molds, mushrooms], *Plantae*, *Animalia*. All these kingdoms support each other, making life an interdependent, integrated, holistic phenomenon.

The scheme below, which I call the **primordial triangle**, is appropriate to describe, in a metaphorical way, the relations and interdependence of individuals, societies (as groups of individuals) and nature.



Geometrically, a triangle exists as a conjugation of six elements, three vertices and three sides. There is no triangle if one of these elements is missing. There is no life if one of the six elements [individual, other/society, nature and the relations connecting them] is missing.

Individual, society and nature relate to each other according to continuation and survival strategies. I will not discuss these strategies. Some claim that these strategies obey principles of physiology, sociobiology and ecology, while others claim that they reflect chaotic or synergetic behavior. The facts are that survival is inherent to every living species and that the equilibrium, symbolized in the triangle, must be maintained. Modifications, which reflect specificity of different species, do not change this metaphorical image.

Other forms of life, in different universes, would probably call for a different metaphor. We can hardly conceive the same principles of physiology, sociobiology and ecology for possible extra-terrestrial or even terrestrial equivalents to life.

Alternative life-forms organisms that might use different genetic codes may evolve to complex living beings. Experiments in this direction, what goes beyond current genetic engineering, are increasing, although this raises new ethical and safety issues. Most probably, these living organisms will not follow the triangle metaphor.

Even more intriguing would be the principles governing Artificial Life, which is about the study of non-organic organisms, which have a life-like behavior, but that go beyond the creation of nature. Artificial Life results when something becomes more than the sum of its parts. A good example is life itself. Although its proponents claim Artificial Life is fundamentally different from Artificial Intelligence, they share the primary goal of explaining existing life, as well as creating something new. Artificial Intelligence developed into robotics. Self-reproducing robots are not out of possibility. What principles will regulate robotic life? Most probably they will not follow the triangle metaphor.[15]

Relations, such as mating and societal arrangements, are intrinsic to the same species, and collective actions obey patterns of behavior dictated by genetic structure. At the

same time, individuals should relate with their environment and with other species, through action upon the nature in which they are immersed, as a constituent part of it. Even preying is essential for survival. Collectively, as a society, preying keeps an equilibrium. These patterns of behavior, represented by the sides of the triangle, are regulated by the principles of animal physiology, of sociobiology and of ecology.

Accumulated experiences, both by the individual and by the species, constitute what is called, in the broad sense, knowledge. Knowledge is present in animal behavior. The strategies of instant behavior, which result from the knowledge acquired by each individual, are called instinct.

From survival to transcendence

In the final quarter of the 19th century, Edwin A. Abbot wrote a beautiful fable, in which all creatures are planar. [16] The *Square,* which is the narrator in Abbott's fable, was allowed to raise from the plane and to venture into the third dimension. Very much like the *Square*, men probe into higher dimensional spaces for explaining, understanding, predicting, creating. The immediate answer is the search of an *omni-*, the omniscient, the omnipresent, the omnipotent, whose habitat transcends reality. This is the hope to overcome the limitations intrinsic to life, hence to the planar reality. Religion emerges as a set of explanations.

In the metaphorically planar reality, hominids appeared about 6 million years ago, maybe with the emergence of the *Orrorin tugenensis*, whose fossil was found in Kenya's Tugen Hills. Every once-a-while, fossils are unearthed, which provide new elements for the controversial theories of human evolution.[17] From the better known *Australopithecus* through the *homo sapiens* and, finally, to our own species, *homo sapiens sapiens*, the primordial triangle continues to be the essence of the phenomenon life. But, as we will see below, another triangle is superimposed into it.[18]

The species *homo* are highly differentiated. Human beings act according to intelligent strategies, the link between knowledge and behavior, which I call **consciousness**. The extent of our integration in the basic primordial triangle is the measure of our consciousness.

Consciousness overcomes and subordinates instinct. Instinctive behavior is, sometimes, called insane and treated as such.[19] Insane is mentally deranged, senseless, such as psychopaths, who have amoral and antisocial behavior.[20] But we must be equally concerned with normopaths, who uncritically obey and follow orders. Discourse and even slogans and watchwords may lead to despicable behavior and abhorrent actions.

In the human species, action manifests, basically, in two ways:

> • actions which lead to survival and satisfaction of needs, common to all living beings, which are performed in the instant;
>
> • actions which satisfy man's needs for explanations, for understanding, for prediction, for creating, which lead to transcend the instant and to search the past and probe into the future.

The species *homo* seem to be the only that developed a sense of past and of future, transcending the present. It is the **pulsion of transcendence**. The associated pulsions of survival, common to all living beings, and of transcendence, unique to the human species, characterize human life.

The geometrical metaphor is appropriate in the identification of the phenomenon life with the triangle. To break this triangle into each of its vertices or sides means the termination of life in the planet. This justifies calling it the primordial triangle, and calling **reality** the universe in which we place this triangle, which in our metaphoric image is the entire plane. Every instant is an specific arrangement of the triangle.

With the emergence of the species *homo*, tools, instruments, equipment, techniques came into playing a role in the relations between individual, other/society and nature. The relations of this new species with nature do not escape the model of the primordial triangle.

Particularly important was the search for nourishment and shelter, essential for survival. In competition with larger animals, hominids depended on carcasses for nourishment. Regarding shelter, in the 1st century b.c., the Roman architect Vitruvius wrote:

> "Men, in the old way, were born like animals in forests and caves and woods, and passed their life feeding on food of the fields. Meanwhile, once upon a time, in a certain place, trees, thickly crowded, tossed by storms and winds and rubbing their branches together, kindled a fire. Terrified by the raging flame, those who were about that place were put to flight. Afterwards when the thing was quieted down, approaching nearer they perceived that the advantage was great for their bodies from the heat of fire. They added fuel, and thus keeping it up, they brought others; and pointing it out by signs they showed what advantages they had from it. In this concourse of mankind, when sounds were variously uttered by the breath, by daily custom they fixed words as they had chanced to come. Then, indicating things more frequently and by habit, they

> came by chance to speak according to the event, and so they generated conversation with one another. Therefore, because of the discovery of fire, there arose at the beginning, concourse among men, deliberation and a life in common. Many came together into one place, having from nature this boon beyond other animals, that they should walk, not with head down, but upright, and should look upon the magnificence of the world and of the stars. They also easily handled with their hands and fingers whatever they wished. Hence after thus meeting together, they began, some to make shelters of leaves, some to dig caves under the hills, some to make of mud and wattles places for shelter, imitating the nests of swallows and their methods of building. Then observing the houses of others and adding to their ideas new things from day to day, they produced better kinds of huts."[21]

Shelters provided a protected space for consuming carcasses retrieved from the savanna. With the help of flaked stone tools, it was possible the access to better quality food, such as the meat and marrow of very large thick-skinned mammals. This provided the high metabolic energy demanded by the large brain of the species. Tools became essential. This marks the emergence of the species *homo*, 2.5 million years ago.[22]

The regular use of fire, about 500,000 years ago, allowed for improved social life. A 2.4m wooden arrow, used about 200,000 years ago, has been recovered by scientists. Both to retrieve scavenged carcasses and to hunt large animals demanded social cooperation, division of labor and the knowledge of characteristics and behavior of the prey. The cave ambiance was favorable for developing language and familial relations.[23]

A later development of shore-based diet, consuming fish, seabirds' eggs, mollusks and other marine foods, seems to be responsible for accelerating human's brain evolution.[24] Looking for coastal settlements was a consequent strategy for abundance of this needed food source.

Social life emerged. But, the new species began to overlook its condition of being an integral element of the triangle, and began to act as exploiter or mere observer, and to exhibit other characteristic behavior. Both as exploiter and as observer, which indeed cannot be separated, the new species developed material and intellectual instruments to deal with natural facts.

Maybe due to a special development of the neck and of the head, manifested mainly in a special arrangement of the internal ear, it became natural to stand on two feet, allowing for a more acute sense of observation.

The natural position of standing, bipedism, is usually appointed as the main earliest distinction of hominids from other primates. Indeed, footprints are important elements in studying early man. Bipedism gave the new species great possibilities of moving. Allied to an unprecedented capability of adapting to new environments, to a great extent due to the capability of modifying it, hominids became the great travelers among the species. Man took possession of the Earth, creating the possibility of new experiences.

The capability of "going and staying" and of "going and returning", not only created the possibility of new experiences, but also of new encounters, overcoming genetic and cultural limitations imposed by kin.

Encounters of various kinds created, thanks to the emergence of language, the possibilities of sharing inaccessible experiences and became a fertile ground for the imaginary. Thus, teaching acquired another dimension and took preponderance over learning, becoming an efficient instrument of power.

Although communication is common in all species, in the species *homo* the differentiation of the upper part of the trachea allowed for a different arrangement of sounds, thus creating the possibility of a very sophisticated form of communication, called, in general, **language**. When did *homo loquens* emerge? Maybe sometime between 100,000 and 50,000 years ago. It is clear that this capability, combined with a growth of the cerebral cortex, gave origin to new species, culminating with *homo sapiens sapiens.* These new species have a much better control of the body, an acute capability of receiving vast amount of information and of processing this information, an enormous sense of memory, and the development of a sense of past and future, transcending the instant. Language and the evolution of animal species to *homo* is a most intriguing theme.[25]

One of the most intriguing moments in the origin of our species is the *homo neanderthalensis,* which we encounter in the evolutionary route to *homo sapens sapiens*. The *neanderthalensis*, a different species, have shared natural resources, particularly in Eurasia, with the *homo sapiens sapiens,* from almost 100,000 years, until about 35,000 years ago, when they became extinct. Maybe the cause of their extinction was their lack of perception of the future. They did not plan ahead, while *homo sapiens sapiens* provided with due foresight. We may be lacking this characteristic responsible for the survival of our species.

The animal characteristics and the pulsion of survival became subordinated to the pulsion of transcendence. The evolution of the new species, *homo sapiens sapiens,* which is, the same as any living species, constantly in the process of struggling for survival and for the continuity of the species. In this process, man acquires

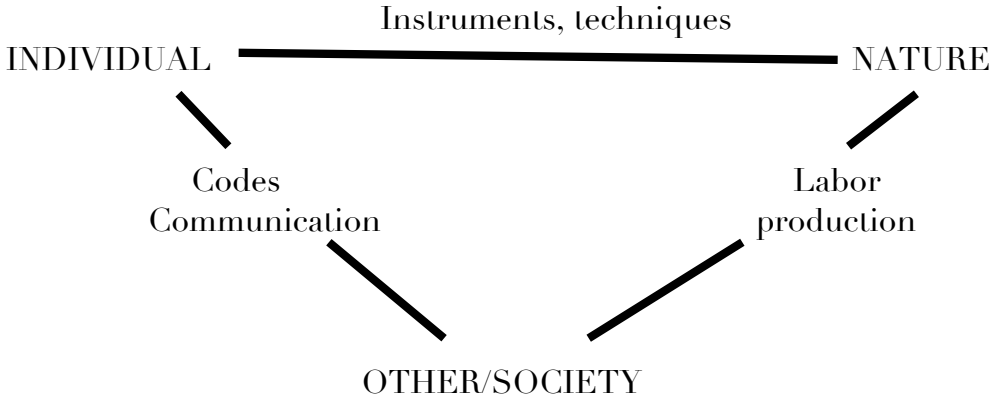
introspective consciousness and mediators among kindred and with nature, such as communication, tools, instruments, equipment and techniques. Language acquired exceptional importance in this process.

The pulsion of survival is associated with the pulsion of transcendence. Both are, together, the quintessence of human life. To eat, to breath and to procreate take another meaning. The purely animal pulsion of survival of the individual and of the species, through nourishing and mating, is now associated with the pulsion of transcendence. Thus, nourishing and mating, purely animal pulsions, are, in the human species, associated with pleasure and emotions and are impregnated with rituals.

Discovering the other, which in all the animal species is a natural strategy for the continuation of the species, in our species acquires another dimension. The search and discovery of "thee" is the first step for transcending one's own space, for projecting oneself, indeed a necessary preliminary step towards transcending one's own existence. The recognition of "thee" and the search for a "common thee" lead to the development of a creative form of communication -- language - and of emotions - like/dislike, prefer/reject - and to the creation of myths and symbols, of traditions and norms, of wisdom and knowledge, of culture in its broadest sense. Individuals subordinate themselves to categories of behavior which will be intermediaries in their relations with their kinds. These categories dominate the relations between individuals and society.

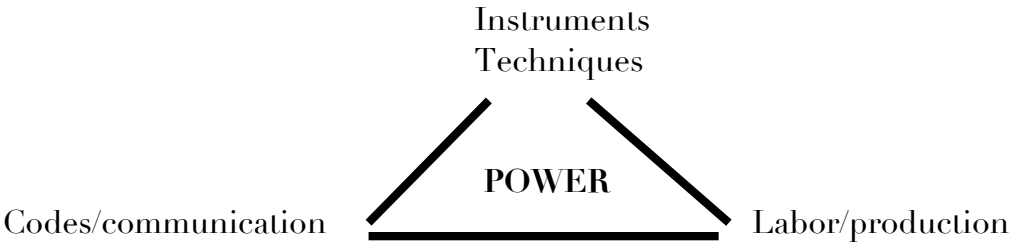
The relation between society and nature, equally essential for survival, acquires new aspects, which go beyond the principles of ecology. The driving force of survival of the species is modified by factors resulting from the mediators indicated above. Examples are labor and division of labor, property, and a concept of production which leads to a different hierarchy and power structure. Transcendence leads to a new dimension of nature, which I call simply reality, meaning everything, material and observable, as well as fantasies and unobservable.

The mediators created by the new species, superimpose another triangle to the triangle of life, expressing the new intermediacies between individuals, other/society and nature. We are thus lead to expand the metaphor of the primordial triangle to the metaphor of an **enhanced triangle**:



Brute force and fitness to procreate are subordinated to factors such as acting and taking measures with due forecast. In other words, to act according to strategies and taking risks.[26]

We thus have the third step of the metaphoric resource to the triangle, which is the **triangle of power**:



HUMAN KNOWLEDGE AND BEHAVIOR: CULTURE AND VALUES

The new intermediacies are the essence of human knowledge. Instinctive knowledge, which is inherent to the animal kingdom, gains another dimension in the new species. Indeed, the word knowledge is used mainly in the sense of human knowledge.

Knowledge in the human species is recognized in the acquisition of abilities, capabilities, ways of doing, of explaining, of understanding, of coping with everyday needs of survival and of transcendence, and takes the form of distinct ways of communicating, invention of different instruments, acceptance of distinct ways of organizing and dividing labor.

Knowledge is the result of action generated by an individual, let us call INDIVIDUAL "A", who processes information from reality, which encompasses everything and is permanently changing. Schematically, we have a cycle:

> . . . REALITY informs the INDIVIDUAL "A" who processes the information and defines strategies of ACTION "A" which inserts new FACTS [ARTIFACTS and MENTIFACTS] into REALITY which, thus enriched, informs the INDIVIDUAL "A" who processes the new information and defines other strategies . . .

Some of these manifestations deface nature. More than the mere agglomerate of natural facts, nature now exhibits new man-made facts, **artifacts** and **mentifacts**, all produced by the human species. [27] Reality is thus modified, enlarged. But it remains a "planar" reality, in the metaphorical sense of Abbott.

Artifacts produced by an individual inform other individuals through the senses - which, in the current status of scientific understanding, we know and control only minimally. But mentifacts inform only the individual producer, through memory. Only when mentifacts become artifacts, they can inform others and be collectivized through sophisticated system of codes, such as language in the broad sense, and symbols. The interplay of codes and symbols sometimes manifest as fiction, as dreams and other plays of the imaginary, all identified with creativity. To understand this interplay is the major concern of psychoanalysis. The senses allow a limited recognition of what is materialized. Vibrations, light, sound, waves or particles, produce sensations beyond the capabilities of perception by the developed senses of humans. High frequencies are not sensed by humans, although they are sensed by other animals. What is not materialized remain in the realm of the supernatural.[28]

The cycle

...REALITY --> INDIVIDUAL "A" --> ACTION "A" --> REALITY --> ...

goes on for INDIVIDUAL "A". But "A" is not alone. Part of the same REALITY is also INDIVIDUAL "B", which performs a similar cycle:

...REALITY --> INDIVIDUAL "B" --> ACTION "B" --> REALITY --> ...

Obviously, INDIVIDUAL "A" and INDIVIDUAL "B", which are anatomically, physiologically and emotionally different, receive different information from the REALITY. Indeed, not only their senses are different, but also the way they process information are different, they have different minds. Consequently, the ACTION "A" performed by INDIVIDUAL "A" is different from the ACTION "B" performed by INDIVIDUAL "B". In general, they are conflicting actions. As a consequence, knowledge generated by INDIVIDUAL "A" and by INDIVIDUAL "B" and behavior of

INDIVIDUAL "A" and of INDIVIDUAL "B" are different. In general, they are conflicting knowledge and behavior.

In mutual exposure, the action of INDIVIDUAL "A" takes into account the action of INDIVIDUAL "B". Knowledge and behavior, of each individual, are thus modified.

Humans developed a form of communication as an action which aim at influencing and modifying the action of the other. Consequently, communication mutually enriches the information received by each individual, and influences actions of both. Thus, it is possible to share knowledge and to render behavior compatible. **Culture** is, essentially, the ensemble of shared knowledge and compatible behavior of a group.

Groups of individuals living in a society, which are subjected to specific natural conditions, share the same responses to this specificity. The satisfaction of the pulsions of survival and transcendence calls for shared knowledge and compatible behavior, and these manifest in communication, instruments and techniques, power and labor structure, myths and symbols, religion and systems of explanations. Rephrasing, this ensemble is the manifestation of the culture of the group.

Survival and transcendence, which are individual pulsions, become, after mutual exposure, subordinated to common interest and common objectives. Thus, shared knowledge and compatible behavior are subordinated to parameters. **Values** are the parameters which subordinate shared knowledge and compatible behavior of a group. These parameters are, consequently, integrated into culture. Values keep a society operational.

Each individual of the species *homo sapiens sapiens* is provided with an internal characteristic which submits the struggle for individual survival and for the continuity of the species, characteristics of all living species, to himself and to his **will**. Will generates the essential need to explain and to understand, to transcend one's own existence, to draw from their ancestors and to project into the generations to come. Man acquires a sense of past and of future, the sense of time.

Thus man develops a new characteristic behavior, unique to this species, which is the capability of decision upon his behavior. This is an essential principle, which in different traditions is called spirit, soul, anima, karma, and several other denominations. These forms of behavior are incorporated in the pool of common knowledge which keeps a group of individuals, a community, a society together and operational.

A limited perception of life in its integrality, due to the lack of intellectual and material instruments of analysis, was responsible for mankind seeing itself the center of the

universe, the apex of the creation process, the favorite of gods. This is clear in the religious traditions.

In the Maori tradition, we read:

> "His other brothers had been broken or fled or had been hidden, but Tumatauenga, or man, still stood erect and unshaken upon the breast of his mother Earth."[29]

Hinduism says:

> "Truly do I exist in all beings, but I am most manifest in man. The human heart is my dwelling place." [30]

And most clearly in the Bible, the source of Western traditions, Jehovah creates man as a confidence-creature, to care for his belongings. A most privileged status in the entire creation.

These primordial explanations generate a sense of a privileged status, identified by Friedrich Nietzsche in the history of mankind, as the "will to power".[31] Power is understood by Nietzsche in a broad sense, not only brute force and domination, but impulse activation and ego satisfaction in fulfilling fundamental processes in life, such as sexual conquest, acquisition of wealth, the realization of a piece of art, the endeavor of a scientist to know the truth, the expectation of gratitude from charity, the seeking of followers by charismatic leaders. In other words, to seek distinction. In this broad sense, for Nietzsche

> "Life is not the adaptation of inner circumstances to outer ones, but will to power which, working from within, incorporates and subdues more and more of that which is 'outside'." [32]

The fulfillment of the will to power is the sense of accomplishment, the sense of winning, which demands overcoming obstacles. As Edgar Bodenheimer observes in his interesting study of Nietzsche's conception of law,

> "The fittest members of the human race strive for insecurity, not for security or contentedness; they seek out danger, risk and the hard life; they build their cities on the slopes of active volcanoes and send their ships into uncharted seas." [33]

An ingrained feeling of privilege is in human nature. We struggle for winning, we offer gifts -- or pray -- for being favored by superiors, we dream with the possibility of being

the best. In essence, this is the will to power. Much of the despicable behavior of mankind results from the struggle of the individual to fulfill the will to power. This struggle manifests in demand and frustration with one's own successes, and attitudes towards others and nature, such as arrogance, violence, bigotry and greed, which, collectivized, lead to organized confrontation, such as war. Peace, conceived in its many dimensions, inner, social, environmental, military, results from overcoming the ingrained feeling of privilege common to human beings.

Culture thus manifests itself in different, obviously interrelated, forms and domains. Cultural forms, such as language, mathematical practices, artistic manifestations, religious feelings, family structure, dressing and behavior patterns, are thus diversified. They are, of course, associated with the history of the groups of individuals, communities and societies where they were developed.

Cultural diversities are present and are impossible to avoid. Indeed, cultural diversity must be stimulated, as the source of creativity. A larger community is partitioned into several distinct cultural variants, each owing to its own history and responding differently to the same stimulus. Intra-cultural relations are enriching and, at the same time, challenging. Humanity at large is partitioned into different cultures, revealing sometimes conflicting forms. Intercultural relations are also enriching and also challenging. Intercultural, and sometimes even intra-cultural, conflicts are impossible to avoid. To live with these cultural conflicts is the main theme of **cultural dynamics**. To reach the capability of living with cultural conflicts is the ultimate goal of civilization. The strategy to reach this goal is transdisciplinarian and transcultural knowledge.

I resume the reflection above about encounters of various kinds. I mention encounters among individuals [the fabric of society], encounters with strangers [fundamental for understanding inner feelings and emotions], encounters of generations [the essence of education], encounters with the imaginary [generating fiction].

Now, in the era of technoscience, we are intrigued by encounters in space and encounters of genetically modified species. The ambiance has always been a major factor for the outcome of the encounters. This is reflected in the idea of neutral ground, frequent in history, in particular in political history. Much of the religious developments are attached to places. How will this be when the ambiance is, itself, an integrated component of the encounter, such as a space station? Which are the traditions backing the behavior of a couple of *in vitro* fertilized human beings?

The essence of humanity

We are thus lead to discuss the meaning of being human or the essence of the human being. The play between the noun "being" and the verb "being" synthesizes this discussion. The essence of humanity is attained when the two, noun and verb, attain a symbiotic relation.[34] This can only happen in a dimension superior to the flat two-dimensional "planar" reality, reminding of Abbott's fable.

History shows us the close relations among the intermediacies, that is, instruments/techniques, codes/communication and production/labor. The superposition of the triangles of survival and of transcendence is the metaphoric symbol of the human species. It is the substantive aspect of *Homo sapiens sapiens.* The metaphor of the figure resulting from the superposition of the two triangles, of survival and of transcendence, stands for the essence of being human and for the recognition, by the human species, of the essential needs of survival and transcendence. But it carries, with it, the essence of power.

A further step towards total wisdom would be to reach another dimension. The human species gives a step which differentiates it from all other species which live in the "planar" dimension. To transcend is the effort to go beyond reality and this is a move to another dimension. Both past and future go beyond reality and belong to another dimension. We cannot reach this dimension, but are driven to it. To penetrate this new dimension is man's attainment of spirituality, it is reaching the karma, it is the step beyond the materiality of two-dimensional reality. The drive towards this is the essence of will. Thus man attains his plenitude, reaches humanity, takes possession of his self, only in this enhanced reality. This is our concept of how human beings acquire the full status of being human.

Is this immersed in a higher dimensional reality? Although we probe into the unknown, into the higher dimensions, which is the domain of omniscience, omnipotence and omnipresence, this goes beyond the capabilities of our perception as a species. Our goal, as human beings [substantive], is to attain the full dimensionality of reality, but what gives meaning to being human [verb] is the drive towards an enhanced reality, which transcends the sensorial and the explainable.

Reflecting upon the behavior of living species, we see a form of wisdom in nature, inaccessible to our current understanding. Attempts to explain this wisdom are seen in basically two different ways:

- in the search of laws which determines a rigorous and predictable behavior, mathematically precise -- in the terminology of the prevailing paradigm and anchored in experimentation;

- in making sense of the complexity which defies the basic assumptions of cause and effect, drawing on experiences.

The first way leads to the success of the concept of progress, intrinsic to Western civilization. Representatives of this approach are René Descartes, Isaac Newton and all those associated with the reductionist approach, characteristic of modern science - understood as the system of explanations based on the Newtonian paradigm, organized in epistemological cages. It leads to deeper look into phenomena by narrowing the field of interest and by treating them under increasingly limited specific methodological precepts. But this does not resolve the search for global explanations, thus paving the way to the multidisciplinarian and to the interdisciplinarian approaches. Both are nothing more than recurrent incursions into the unknown with the same or similar methodological instruments, shifting the focus to other categories of questions. They are no more than larger epistemological cages.

Challenges to the system of explanations offered by modern science soon started to mount, made possible by sophisticated material and intellectual instruments, paradoxically developed thanks to the same modern science. We might say modern science created the instruments to be challenged. Most remarkable is quantum mechanics.

We can not be successful in our search for explanations, if we remain in the level of classical methods of science and focus our views on functions and their domains and counter domains. In other terms, if we restrict our analysis to cause and effect. We need to go a step further, looking into the categories of analysis themselves and understanding the permanent interaction between the objects of inquiry and between the various strategies of analysis.

The second way calls for an analysis of the dynamics of the full process. Representatives of this thinking are Jan Amos Komensky (1592-1670), Johann Wolfgang von Goethe (1749-1832), Max Planck (1858-1947), Kurt Gödel (1906-1978) and followers of what is sometimes referred to as transdisciplinarity, complexity, or, more generally, as open systems of knowledge. In a metaphorical synthesis, to fly outside epistemological cages. This approach allows for understanding the basic triangles of survival and transcendence. It would be incoherent in the course of ideas in this paper to propose a definition of transdisciplinarity.

Referring to arguments raised in the beginning of this paper, the first way implies an ideologically loaded objectivity, based on experimentation. Of the second way, the result relies on coherence and objectivity mixed with interpretive subjectivity.

An individual is realized only as one element of the integrity of the six elements of the primordial triangle. This necessarily implies humility, man must be humble in the face of life. It voids the will to power, as discussed above, and the reliance on privileges other than those subordinated to values.

It is clear that privileges are associated with values. Indeed, values justify privileges. Thus, in encounters of groups sharing different systems of values, it is not possible to abolish conflicting privileges supported by respective values, which are cultural products. We must avoid that these conflicts rise into confrontation.

The possibility of overcoming confrontation, violence, aggression, bigotry and the despicable behavior, so common throughout history and taking enormous proportions nowadays in the entire world, depends on the capability to subordinate values to the higher ethics of diversity, of respect, solidarity and cooperation, which is transcultural.

Education, which has been an exercise of inter and intra-cultural dynamics, must move into a transdisciplinarian and transcultural practice to become the road to peace. Repeating what was said before, the only possibility of escaping extinction of civilization is to achieve peace in all its dimensions: inner peace, social peace, environmental peace and military peace.

Peace is the result of the capability of dealing with unavoidable conflicts due to individual differences [individuals are all different], without resorting to confrontation and aggression and avoiding arrogance and bigotry. The way to achieve peace is through education. **Education for peace** thus becomes the key for the survival of mankind.

I recall an appeal in the Pugwash Manifesto, of Bertrand Russell and Albert Einstein, issued in 1955, which says:

> "We have to learn to think in a new way. We have to learn to ask ourselves, not what steps can be taken to give military victory to whatever group we prefer, for there no longer are such steps; the question we have to ask ourselves is: what steps can be taken to prevent a military contest of which the issue must be disastrous to all parties?
> ...
> There lies before us, if we choose, continual progress in happiness, knowledge, and wisdom. Shall we, instead, choose death, because we cannot forget our quarrels? We appeal as human beings to human beings: Remember your humanity, and forget the rest. If you can do so, the way lies open to a new Paradise; if you cannot, there lies before you the risk of universal death." [35]

We have to learn to think in a new way.

NOTES

[1] http://www.greenpeace.org/international/en/

[2] *Tout sur ATTAC*, Éditions mille et une nuits/Librairie Arthème Fayard, Paris, 2000. See https://www.attac.org/en

[3] http://anonofficial.com/

[4] *Isidore de Seville: The Medical Writings*, translation and comments by William D.Share, The American Philosophical Society, Philadelphia, 1964; p.38.

[5] I use the word pulsion in the psychoanalytic sense, in a sense similar to *trieb* as used by Sigmund Freud.

[6] It is common to refer to four great civilizations of Antiquity: Egypt, Mesopotamia, Greece and Rome. Indeed many civilizations were flourishing in the same epoch. Seventeen civilizations are listed by Matthew Melko: Mainstream Civilizations, *Comparative Civilizations Review*, n°44, Spring 2001; pp.55-71.

[7] Peter Raine: Beyond Universalism. The Shaman and the Ecologist. An ever open horizon. *INTERculture*, Issue No.140, April 2001; p.5.

[8] C.P.Snow: *The Two Cultures*, Cambridge University Press, Cambridge, 1959.

[9] John Brockman: *The Third Culture. Beyond the Scientific Revolution*, Simon & Scuster, New York, 1995; p.22.

[10] Illustrative of this arrogance is the polemic raised by Alan Sokal hoax, which deflagrated the so-called "science wars". See *The Sokal Hoax. The Sham That Shook the Academy*, Edited by the editors of Lingua Franca, University of Nebraska Press, Lincoln, 2000.

[11] Halton Arp: *Seeing Red: Redshifts, Cosmology and Academic*, Apeiron Books, 1998.

[12] Raimon Panikkar: Myth and History, *Myth, Faith and Hermeneutics*, Paulist Press, New York, 1979; p.100.

[13] Peter Raine, *op.cit.*, p.13.

[14] What is reality? This is a most crucial question. I avoid the distinction between the concrete and the abstract [ideal], probably closer to the *Dasein* of Hegel. I understand reality as the totality of phenomena and facts, both artifacts and mentifacts, and the relations among them. Reality is dynamic and in many aspects individualized. Mentifacts are exclusive of the individual reality and are not shared unless they become artifacts. Througout history, individuals and groups have developed strategies to force individuals to reveal their mentifacts, such as intimidation, in the form of torture and religious confession, brain washing and ideological *mea culpa*, up to truth serum. All these are untrustful. Every individual creates his/her own reality, even if some aspects are shared, spontaneously or through artifices. Individuals affected by schizophrenia is an extreme example, they have a reality of their own.

[15] See the intriguing book by Hans P. Moravec: *Robot: Mere Machine to Transcend Mind*, Oxford University Press, New York, 1999. The same theme is dealt with in the film *The Matrix*, dir. Andy and Larry Wachovsky, 1999.

[16] Edwin A. Abbott: *Flatland. A Romance of Many Dimensions* (orig.edn.1884), reprinted with an Introduction by A.K.Dewdney, New American Library Inc., New York, 1984.

[17] See Michael Barter and Ann Gibbons: Another Emissary From The Dawn of Humanity, *Science* vol. 293, 13 July 2001; pp.187-189.

[18] An interesting overview of the evolution of the species is given in the book by Colin Tudge: *The Time Before History. 5 Million Years of Human Impact,* Simon & Schuster, New York, 1996.

[19] Insane as someone that does not accept limitations. This is very well illustrated in the movie *Instinct*, dir. Jon Turteltaub, 1999, based in the fable by Daniel Quinn: *Ishmael. A Romance of the Human Condition*, Bantam Doubleday Books, New York, 1992.

[20] This is well shown in the movie *A Clockwork Orange*, by Stanley Kubrick, 1971, based on Anthony Burgess's novel of same title, published in 1962.

[21] Vitruvius, *De Architectura I,Books I-V*, transl. F.Granger, The Loeb Classical Library, Harvard University Press, Cambridge, 1931; pp.77-79.
[22] See the interesting research report of Stanley H. Ambrose: Paleolithic Technology and Human Evolution, *Science*, vol.291, pp.1748.
[23] An interesting survey of these achievements can be seen in Catherine Perlès: Les stratégies alimentaires dans le temps préhistoriques, *Histoire de l'Alimentation*, dir. Jean-Louis Flandrin et Massimo Montanari, Librairie Arthème Fayard, Paris, 1996; Chapitre Premier, pp.29-46.
[24] Ann Gibbons: Humans' Head Start: New Views of Brain Evolution, *Science*, vol.296, 3 May 2002; pp.835-837.
[25] See the recent book by Robert C. Berwick and Noam Chomsky: *Why Only Us: Language and Evolution*, Cambridge: The MIT Press, 2016.
[26] The evolution of civilization seen as the capability of taking risks is nicely elaborated by Peter L. Bernstein: *Against the gods. The remarkable story of risk*, John Wiley & Sons, New York, 1996.
[27] Mentifacts were introduced by Julian S. Huxley in his study on "Evolution, Cultural and Biological", on *Yearbook of Anthropology*, 1955, The University of Chicago Press, pp. 2-25, as "mental constructions which provide the psychological framework of a culture and carry out intellectual, aesthetic, spiritual, ethical or other psychological functions."
[28] A number of cases of mental, distant and postmortem communication are reported. Either facts or fakery, they are an integrating part of the imaginary of man. They are explained as extra-sensorial capabilities of certain individuals. Similar to what up to about 100 years ago was accepted as an explanation for schizoid behavior.
[29] Maori Religion. On the Origin of the Human Race, *World Scripture. A Comparative Anthology of Sacred Texts*, A Project of the International Religious Foundation, Paragon House, New York, 1993; p.217.
[30] Hinduism. Srimad Bhagavatam 11.2, *op.cit.* p.215.
[31] Friedrich Nietsche: *The Will to Power*, ed. W. Kaufmann, New York, 1968.
[32] *op.cit.* p.361.
[33] Edgar Bodenheimer: *Power, Law and Society. A Study of the Will to Power and the Will to Law,* Crane, Russak and Company, Inc., New York, 1972; p.8.
[34] This interplay appears in many religions. It is quite explicit in the phrase "And the Word was made flesh, and dwelt among us" [John 1:1,King James Version]. Through baptism, the man incorporates *logos*, thus becoming favored by Jehovah.
[35] https://pugwash.org/1955/07/09/statement-manifesto/

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