TRANSDISCIPLINARY PERSPECTIVES IN BIOETHICS: A CO-EVOLUTIONARY INTRODUCTION FROM THE BIG HISTORY

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The main objective of this work is to expand the bioethics notion expressed in the Article 17th of the Universal Declaration on Bioethics and Human Rights, concerning the interconnections between human beings and other life forms. For this purpose, it is combined the transdisciplinary methodology with the theoretical framework of the "Big History" to approach the co-evolutionary phenomena that life is developing on Earth for some 3.8 billion years. As a result, the study introduces us to the unification, integration and inclusion of the history of the universe, the solar system, Earth, and life with the history of human beings. In conclusion, I consider to safeguard the cosmic miracle that represents the emergence of life we must adopt new transdisciplinary perspectives into bioethics to address the ecosystem complexity of co-evolutionary processes of life on Gaia as a whole.

Keywords: transdisciplinary, complexity, humanity, coevolution, Big History, biomimicry, bioethics, Sustainable Development Goals.

Introduction

In September 2015, the United Nations General Assembly held in New York, achieved the commitment of 193 Member States to stop environmental degradation with the Sustainable Development Goals (SDGs) for the year 2030. The final declaration signed by world leaders is known as "*Transforming our World: The 2030 Agenda for Sustainable Development*", and it includes climate change, conservation of terrestrial ecosystems, seas and oceans, as well as other systemic and global goals. In short, the SDGs recognize the socio-ecological problems that characterize the current global civilization beyond their national borders. Hence the need to transgress the current paradigm with the new approach that Big History gives us, because it represents an epistemic tool that conceived the interrelationships of the human condition in its cosmic and earthly context. This is a new transdisciplinary organization of knowledge that allows us to include human cultural systems and natural ecosystems within a co-evolutionary historical process (Collado, 2016b).

The Big History helps us to identify and recognize the sustainable strategies that work in nature to inspire us bio-mimetically in solving human problems (social, economic, technological, etc.). The continued exploitation of materials and energy resources of the Earth by the models of production and consumption has caused a great ecological and social footprint that has been disclosed as unsustainable. A society that walks towards a sustainable development must learn to reduce their ecological destruction, reusing and recycling materials already built. Sustainable development is a dynamic process that requires a "glocal" vision, because the global

progress is an emergency of planetary system which thrives on multiple local progress advancing through systemic mechanics (synergies, feedbacks, etc.) that inter-retro-act with each other, influencing, conditioning, and modifying the different context of world citizenship. According to Robertson (1992), the term "glocal" is a neologism where globalization does not imply an annulment of the local, but an inclusion, presence, and meeting of and with local cultures. We must focus our attention on the paradigmatic horizon of SDGs in a planetary scale, engendering a world where "other worlds are possible". This implies a transcultural recognition and identification of cosmic structures and phenomena that paradigmatically transcend the human condition.

Methodology for sciences of complexity

The idea of interconnection between human beings and other life forms leads us to revise the concept of development through transdisciplinary study of co-evolutionary processes that life has developed since their appearance on Earth some 3.8 billion years ago. The "cosmic miracle of life" is a transdisciplinary challenge we must integrate to safeguard all biodiversity that coevolves in Gaia[1]. This article of reflection has been written from the theoretical framework of the "Big History" coined by historian David Christian in "Maps of Time" (2010) and the theoretically developed by Fred Spier in "Big History and the Future of Humanity" (2011). It is a transdisciplinary work whose main objective is to study the interconnections between human beings and other life forms that coexist in our biosphere, as expressed in the UNESCO Universal Declaration on Bioethics and Human Rights in 2005. If bioethics addresses ethical issues that have to do with life in general, we need an "ecology of knowledge" [Santos, 2010] to establish a transdisciplinary dialogue between scientists and non-scientists knowledge to study the cosmic and planetary coevolution of life since its emergence billions years ago.

For this reason, the article makes a qualitative, exploratory, descriptive, and analytical study that seeks to unify, integrate, and include the history of the universe, the solar system, Earth, and life along the history of mankind. From the theoretical framework of Big History, we are available to understand in a systemic, holistic, and multidimensional way our bioethics responsibility to co-evolve in a sustainable and resilient way on Earth. It means new transdisciplinary ways to manage and organize the knowledge to understand the interconnections of mankind with the different levels of reality that co-exist in nature and the cosmos. The theoretical and conceptual field of bioethics requires, therefore, open to a transversal and complex methodological approach that face many bioethics challenges we have as global civilization to achieve sustainable human development with our environment, the biosphere, and biodiversity.

A brief summary of human co-evolution in Gaia

According with the scientific consensus of Big History, the humanly known universe arose about 13.7 billion years before present (BP), with the explosion of the Big Bang. Earth formation occurred between 5 and 4.5 billion years BP, and the miracle of life appeared around 3.8 and 3.5 billion years BP. During the first half of this period, the forms of first-born life on Earth remained at very simple complexity

[1] Gaia is the primal goddess personifying the Earth in Greek mythology.

levels (as archaebacteria or eubacteria), but the appearance of free oxygen in the atmosphere originated the first complex cells (eukaryotics), some 2 billion years BP. The Cambrian explosion of metazoans took place about 1,5 billion years later, some 542 million years BP. Since then, the biological variety has increased rapidly, forming a wide range of multicellular organisms that are developing survival strategies with very unique energy flows, such as the food chain.

While it seems that life arose in the depths of the oceans, it only managed to reach the mainland about 450 million years BP. Only 250 million years after reaching the Earth´s surface came the first warm-blooded animals, where dinosaurs highlighted during the Jurassic period until they disappeared 66 million years ago by a supposed asteroid impact on Earth. As Christian (2010: 162) noted, this circumstance gave rise to hegemonic period of mammals, from where emerged later the first bipedal hominids around 7 million years BP. Thanks to carbon-14 testing performed on fossil remains found to date, we can know in an approximate way the dating of first Australopithecus, which seem to be about 4 million years. Homo Habilis dates from 2.5 until 1.9 million years, those of Homo erectus are around 1.9 million years, and those of Homo neardenthalis and Homo sapiens point about 200,000 years ago. With the extinction of Homo floresiensis about 13,000 years ago, Homo sapiens is the only survivor of the human species that co-inhabits and coevolves on planet Earth with the rest of the animal biodiversity, plants, insects, bacteria, etc.

Co-evolution is a term coined by biologist Paul Ehrlich and botanist-environmentalist Peter Raven in 1964. In their joint work "Butterflies and Plants: A Study in Coevolution", they approached the reciprocal evolutionary influences of plants and insects that feed on them: "an approach to what we would like to call coevolution is the examination of patterns of interaction between two major groups of organisms with a close and evident ecological relationship, such as plants and herbivores" [Ehrlich & Raven, 1964: 586]. While the idea of co-evolution was not new and had already expressed in previous theories, the use made for Ehrlich and Raven allowed thinkers from other fields of application make new interpretations. In 1980, evolutionary ecologist Daniel Janzen was the first to define the concept of coevolution in his paper "When Is It Coevolution?" "«Coevolution» may be usefully defined as an evolutionary change in a trait of the individuals in one population in response to a trait of the individuals of a second population, followed by an evolutionary response by the second population to the change in the first", Janzen (1980: 611) explain adding that "«diffuse coevolution» occurs when either or both populations in the above definition are represented by an array of populations that generate a selective pressure as a group." Thus, ecological interdependence requires three basic principles: 1) specificity, where the evolution of each specie is due to the selective pressures of the other; 2) reciprocity, when both species jointly evolve; 3) simultaneity, both species evolve simultaneously. So the co-evolutionary process has been used in a relatively restricted sense in the context of biological evolution.

But the sense of "coevolution" used in this research goes beyond to discuss in bioethics: including both the degree of mutual phylogenetic partnership as the degree of mutual change in the co-adaptation, but also global processes of macroevolution and specific processes of microevolution. Coevolution is defined, then, as a reciprocal evolutionary change among species and their natural environment that, during the complex development of inter-retro-actions with each other, mutually modify each

other constantly. This view is in harmony with the thought of philosopher Oleg Bazaluk (2014), which integrates consciousness in his article "Neurophilosophy in the Formation of a Planetary and Cosmic Personality", but also with the distinction between biological and social evolution introduced by historians Andrey Korotayev, Alexander Markov, and Leonid Grinin (2015). Coevolution is a feedback process very present in nature and has been basis for agricultural and industrial exploitation of human beings in their historical evolution on Earth. As explained by ecological economist Richard Norgaard (1994: 39): "with industrialization, social systems coevolved to facilitate development through the exploitation of coal and petroleum. Social systems no longer coevolved to interact more effectively with environmental systems." With Industrial Revolution, began an era of hydrocarbons that drastically changed co-evolutionary processes of the prior agricultural stage of mankind. When social systems began to exert strong pressure on environmental systems, the stock of energetic and material resources decreased very quickly: starting an evolutionary period of planetary unsustainability.

The globalized society of 21st century must become aware, urgently, of socioeconomic unsustainability of "four-engine-of-globalization": science, industry, capitalism, and technology [Morin, Roger, & Motta, 2003: 104]. They are seriously jeopardizing both future human generations and the rest of natural ecosystems. It is necessary to organize transdisciplinary knowledge to understand that our specie evolution is intrinsically interlinked with constant co-evolution processes that different life forms are developing on our planet Earth from billions years ago. It is a multidimensional coevolution that unfolds through inter-retro-actions between different levels of cosmic, planetary, regional, national, and local reality, where an extensive network of universal interdependence is established with ecological, biophysics, social, political, cultural, economic, and technological phenomena. Hence the uncontrolled exploitation of natural resources for the manufacture of industrial products has become an issue of great concern in the international agenda, where different geopolitical actors study and analyze, for decades, cross-border phenomena that affect all life forms.

In this context, bioethics emerges as a transdisciplinary science that deals with studying the complexity of inter-retro-actions developed between dynamic systems that make life (humans, animals, plants, etc.), within an environment which houses the ideal conditions for coevolution. The human beings is the unique species that participates in a cosmic dance starred by matter-energy phenomena whose symphony reminds us that we are active players in the coevolution of a common world shared with ecosystems of Gaia. "We now recognize the Earth as a single self-creative being who came to life in its rotating dance around the space" says biologist and futurist Elisabet Sahtouris (1998: 25-26), adding that "as we gather the scientific details of the dance of life on our planet (…), the evolution of our species takes a new meaning in relation with the whole." Hence the systematic degradation of nature makes us accomplices of a global ecocide, since the ecological footprint is perpetuated by our active participation in consumerist dynamics and our bioethics passivity before the destruction of life on our planet Earth, which is our sacred common good. "There are few more alarming indicators about the brutal climate imbalance that we have implemented, and the consequences will be terrible (ecocide and genocide, if you want to express in a synthetic formula), argues the philosopher Jorge Riechmann (2014:

333). Our common future is built today and we cannot fail to future generations.

With such imbalances, future generations will suffer the climatic consequences of global warning caused by our current consumer culture (chronic shortage of resources, ecosystem changes, loss of biodiversity, glacier melting, rising sea level, deforestation, pollution of soil, water and air, etc.). For all those reasons, bioethics represents a real quantum shift in the epistemological construction of knowledge because its multi-referential epistemic frame goes beyond of traditional moral issues of human welfare to integrate new technological developments that radically altered the vital phenomena of own nature. The debate on the human future image should be extended to new transversal fields to enhance its speech...

Transdisciplinary bioethics: its cosmic origin

Understanding the origin and evolution of life in the universe is a fundamental piece for the conceptual development of transdisciplinary bioethics, since not only get contextualize the cosmic miracle of life on Earth, but also sensitize us raising awareness about the need to transform our socio-economic systems to overcome the great ecological footprint we are leaving in Gaia. All consumption of natural resources, whether material or energetic, come from nature. The idea of progress that West has implemented to the rest of the world since Modernity is based on exploiting natural resources to supply high human demands. It is necessary to wake up from this epistemic illusion and to promote "another possible worlds"[2] that are sustainable with our biosphere. The human being depends on their interconnections with the environment to survive, so we cannot continue to treat nature as a mere object to manipulate under our wish to manufacture industrial products and achieve high economic performance. Could Big History bring out a bioethical consciousness that commits us to achieve universally the challenge of SDGs? When will we learn to preserve life on the planet Earth in front of the epistemic illusion of social and material progress based on unlimited economic growth? When will we understand that our consumer actions are unsustainable and they are damaging the rest of world citizenship and the nature? When will we understand that cultural identity that separates us as individuals and societies is only an epistemological level of our human condition? When will we understand that complex whole cosmos of energy-matter is linked with a vast network of universal interdependence in continuous restructuration?

From an integrative epistemological paradigm, one can answer these questions recognizing that mankind is a subsystem of nature, and therefore, depends on this to develop. The elementary particles that make up our organism, and which are all humanly known matter in the universe, formed between 3 and 4 first minutes after the origin of the universe, as the Big Bang Theory explains [Christian, 2010: 38-50]. The cosmic condition of mankind contextualized us literally in the middle of a gigantic cosmos (infinite?) whose expansion generated billions of galaxies between 700 and 2,000 million years after the Big Bang. Inside these galaxies the first generations of stars were emerging, which began at this time and still continue to be formed today. The carbon atoms that constitute human condition formed in one or more suns before our current one. Our solar system formed while the Sun, during

[2] The third edition of the World Social Forum took place in 2003, held in Porto Alegre (Brazil). "Another world is possible" was the slogan for the global movement of civil society to change the neoliberal models of economic globalization.

the gravitational sinking of a matter cloud occurred some 4.6 billion years BP. The Sun absorbed 99,9% of matter contained in this cosmic cloud (composed by 98% of hydrogen and helium, and the other 2% by other chemical elements), and the other 0,1% of remaining material made possible the formation of other planets and satellites that make up our solar system [Christian, 2010: 88]. This small fraction of rejected matter by the Sun formed a plane disc with different orbits that spin around him. Inside these orbits began to form clusters of matter as a result of cosmic collisions and gravitational attraction, until only one planetary body remained in each orbit. The closest telluric planets to the Sun (Mercury, Venus, Earth, and Mars) acquired heavier materials, which helped them to become more warmer and rocky planets. By contrast, the planets farthest orbits finished accumulating more gases (Jupiter, Saturn, Uranus, and Neptune).

Earth formed in the "galactic habitable zone"[3] with a small fraction of the material expelled by the Sun, self-organizing in dependence on this, and constituting with a particular distribution of chemical elements that favored the emergence of life. According to the model of evolution of the Milky Way of astrophysicists Lineweaver, Fenner, and Gibson (2004: 59), the galactic habitable zone of our cosmic neighborhood is characterized by having "the distribution in space and time of four prerequisites for complex life: the presence of a host star, enough heavy elements to form terrestrial planets, sufficient time for biological evolution and an environment free of life-extinguishing supernovae." These Goldilocks[4] circumstances for the appearance of life made the molecules that make up all known species (including humans) were grouped in the first moments of the Earth formation, becoming new metamorphosed macromolecules for a new organization different of strictly chemistry: self-organization living[5].

Shortly after the Earth formed, it melt and the heavy materials sank to its core and lighter materials surfaced on the surface. While the inner structure of the Earth has remained practically the same since 4 billion years BP, the surface and the atmosphere have been experiencing many changes to acquire the way they look today. With explanations derived from the Plate Tectonics Theory[6], we can know that continental plates where we made (artificially) our modern nation-states have

[3] In astrophysics, the galactic habitable zone refers to the region that exists around a start that hosts proper conditions for the emergence and development of life.

[4] The concept of Goldilocks circumstances refers to the precise conditions brought together to emerge a given complexity. The percentage availability of an appropriate set of core elements is required, as well as the correct input of energy flows and other large number of limiting conditions (temperature, pressure, radiation, etc.).

[5] Some of the best known examples of the principle of self-organization are the dynamic systems of Ross Ashby, dissipative structures of Ilya Prigogine, the autopoiesis of Humberto Maturana and Francisco Varela, the Boolean network of Stuart Kauffman, symbiogenesis of Lynn Margulis, the Gaia hypothesis of James Lovelock, geometrical fractals of Benoit Mandelbrot, or the Theory of Systems of Gregory Bateson, among many others.

[6] According to the theory of geographer Alfred Wegner presented in his book "The Origin of Continents and Oceans" in 1915, the Earth´s surface has been moving all time. Through numerous geographical, geological, paleoclimatic, and paleontological evidence, Wegner showed that about 250 million years BP continents were united in a single continent he called "Pangea". About 50 million years after this continent was divided into two parts: "Gondwana", which included what we know today as Australia, India, Africa, Antarctica, and South America; and "Laurasia", covering North America, Europe, and Asia. Some scientific evidences suggest that there "Rodinia" was another supercontinent before Pangea, which took place between 1,100 and 750 million years BP.

been moving slowly over millions of years to set the current mappa mundi. During all this cosmic epic that caused the origin of life on Earth, the Homo sapiens is just a Cosmo-bio-genetic entity newly arrived 200,000 years ago. We are a "complex adaptive system"[7] that not only tries to adapt to the environment, but also modified it to accommodate our needs. Hence the constructive/destructive capacity of human beings is pushing us to the preface of an evolutionary stage with scarce natural resources that could put an end to the exceptional cosmic adventure that represent life on Earth. For this reason we must recognize the cosmic origin of transdisciplinary bioethics and avoid to fall into barbarism of self-destruction.

How to integrate bioethics into the co-evolutionary processes of the Big History?

To continue with this cosmic adventure of life on Earth, it is urgent that we develop a bioethics consciousness that helps us to understand the great need to preserve and conserve all biodiversity of Gaia. "Ecology of knowledge" derived from transdisciplinary approach of Big History evidence that the emergence of life on our planet is a real cosmic miracle for the factual improbability involved and for the subsequent co-evolution into a fascinating complexity. Hence the importance of expanding the conceptual notion of bioethics made by Fritz Jahr and Van Rensselaer Potter (1998) during the second half of 20th century. I believe we must integrate transdisciplinary knowledge, through different epistemologies and worldviews, to reflect in a systemic-analytical and global-local way about the value of all forms of life that are co-evolving during billions of years in our biosphere. In a broader view of the term, bioethics gains scientific and philosophical interest when studying from the trans-historical perspective of coevolution: where the past, present, and future converge in space-time to defend the cosmic exception that represent the rise of life on our planet.

For better understanding of co-evolutionary interdependence and inter-retro-actions that life is developing on Earth, it is interesting to recall the work "Biosphere" that Russian geochemist Vladimir Vernadsky published in 1926. In this book he developed a theory that understood our planet as a superposition of five integrated realities: atmosphere, lithosphere, biosphere, technosphere, and noosphere. As a whole, Vernadsky understood life as an "ecological force" that partly creates and controls the planetary environment, being very close to the contemporary Gaia hypothesis of atmospheric chemist James Lovelock. But biologist and geologists only began to systematically investigate during the seventies, a period in which this approach was called "geoscience."

In short, the Gaia hypothesis argues that evolution of species and evolution of its material environment are closely intertwined in a single system that co-evolves into a larger self-eco-organization living organism: our planet Earth. The concept of co-evolution helps us to bioethically understand that planetary sustainability will only occur at the moment that world citizenship take individual and collective awareness of their interdependence with ecosystem processes of our planet. To develop this bioethics consciousness in a deeper way is required a "global bioethics" [Potter, 1998] imperative to promote the realization of human potential as a major

[7] The concept of "complex adaptive system" was coined by Murray Gell-Mann, author awarded with the Nobel Prize in Physics in 1969 for his contributions and discoveries regarding the classification of elementary particles and their interactions.

ecosystem actor in the quest to improve the health of life within the co-evolutionary development of Gaia. In other words, to understand the fundamental threat posed by socio-ecological footprint of the actions derived from our systems of production and consumption in natural ecosystems, the concept of coevolution must be established as a major bioethical element both in international political as in the curricula of all educational systems. This co-evolutionary perspective serves as a civilizing guide to walk towards the paradigm of cosmodernity [Collado, Galeffi & Ponczek, 2014] where science and spirituality converge to safeguard life.

As a result, the transdisciplinary bioethics perspective of co-evolutionary introduction of Big History help us to understand that problems of pollution and environmental degradation at large-scale are an individual and collective bioethics responsibility of all global citizens. It is inside of each one of us the potential to transform human cultural artifacts that lead us to barbarism. "Meditation is the beginning of self-knowledge," reminds us the Hindu spiritualist and philosopher Krishnamurti (1996: 138). The existential quest about the past, present, and future of life places the human condition in the middle of an extensive network of interdependences with natural and cosmic processes that we must return to reflect urgently. In this bioethics reflection is necessary to include spiritual and epistemological worldview of the indigenous and aboriginal peoples, since the idea of living Earth is as old as the very ancient civilizations. In the 21st century, we still find inspiration in hundreds of ancestral worldviews of native peoples that still remain in various areas of America, Africa, Europe, Asia, and Oceania. The common denominator of all native peoples worldviews is the spiritual and ecological conception that structures their social organizations, which are in harmony and respect with all forms of life that co-exist on our planet. Another good contemporary example is permaculture [Holmgren, 2010], which seeks to rescue such ancient knowledge.

In a complementary way to these native worldviews, the Gaia hypothesis formulated by Lovelock and Margulis (1989) states, in a scientific way, that the Earth is a self-regulated system where the atmosphere and the surface of our planet system behave as a coherent whole thanks to self-eco-organizer effect of life. The self-regulating character of Earth is a continuous process of inter-retro-actions that plants and other organism exercise by releasing oxygen and other gases into the atmosphere. Gaia seems to become like a huge ecosystem of many ecosystems. "The story of such ecosystems at all scales is the story not merely of evolution, but of coevolution" complements theoretical biologist Stuart Kauffman (1995: 73), adding that "we have all made our worlds together for almost 4 billion years. The story of order for free continues in this molecular and organismic coevolution." In short, Gaia hypothesis postulates that complex networks of feedback loops that make our planet Earth in a self-organizing dynamic system are due to the intimate relationship between living organisms (such as microorganisms, plants, and animals) and the non-living environment (such as the atmosphere, oceans, climate, rocks, the earth´s crust, etc.).

Thus, Lovelock (1983: 82-85) indicates the intimate association between living and non-living parts make the troposphere constitutes the circulatory system of our planet Earth, which is self-regulating by inter-retro-actions with different forms of life with the environment. This is the great conceptual transgression that makes Gaia hypothesis regarding the Darwinian view: consider natural environment as integral

part of life itself. Living organisms born, grow and transform in a habitat that adapts to these through cyclical and constant inter-retro-actions. In this way, the evolution of living organisms are closely linked to the evolution of its environment: adapting each other in a single and continuous process of coevolution. Hence the great importance in overcoming the epistemic fallacy that mental structures of social Darwinism and capitalist postulates of nineteenth and twentieth centuries have historically constituted, because "these views underestimate the Earth and the ways of nature" [Margulis & Sagan, 1997: 35-36].

While it is true, there are processes and situations of violence and competition in nature, the recognition of the coevolution as an ontological phenomenon of life on Earth is a transcendental change in the philosophy of nature. The competitive and warmongers processes derived of Darwinian concept of "natural selection" have been replaced by a new image characterized by inter-retro-actions of mutual dependence and continued cooperation between all living forms with their environments. "Life did not take over the globe by combat, but by networking. Life forms multiplied and complexified by co-opting others, not just by killing them" [Margulis & Sagan, 1997: 29]. In this regard, given the general consensus among the scientific community that sees bacteria as common ancestor to all living species, the study in microbiology has been fundamental in shedding new light rays to the debate on the emergence of life on Earth and its co-evolutionary development over billions of years. Margulis y Sagan (1997: 29) state that "early life´s history came about by the interaction of at least three recently discovered dynamics of evolution": genetic mutations, gene exchange, and symbiosis.

According to these authors, mutations and genetic exchange are the two main ways of bacterial evolution, but not enough to explain the evolution of multicellular organisms from all major forms of life that exist on Earth today. While bacteria are non-nucleated cells (prokaryotes) and are the simplest forms of life, other cells that form the higher organisms are nucleated (eukaryotic). In one of the most fascinating discoveries of modern microbiology, with profound implications for all branches of biology, including bioethics, the observation of mitochondria gave the track for a third evolutionary path with greater explanatory satisfaction. Margulis (2002) called as symbiogenesis. Mitochondria are a thin membrane inclusions found inside the cells of plants, animals, fungi, and protists, provided with similar structure. Although mitochondria are outside the core of modern cells, they retain their own genes composed of DNA. Unlike the cells in which they reside, mitochondria reproduce by binary division in different moments than the division of the rest of the cell. This means that without mitochondria, all plants and animals (organisms composed for cells with nuclei) could not have live because they had been unable to use oxygen.

For this reason, it seems this symbiotic tendency of organisms to live in intimae association has represented, in long term, the origin of new life forms. In other words, cooperation is the defining characteristic of life. Symbiosis is the scientific evidence that confirms our multi-microbial common ancestry with other living organisms of our planet. All our bodies are the factual evidence of the true history of life on Earth. "Our Cells maintain an environment that is carbon –and hydrogen-rich, like that of the Earth when life began" [Margulis & Sagan, 1997: 32]. The importance of symbiosis concept in the new epistemic vision we have about our planet Earth allows us to realize that Gaia is a self-regulating dynamic system that has been

evolving long before the appearance of any living species. The study of communities of microorganisms provides us an ecosystem key to understand how life has been collaborating for 3.8 billion years to maintain sediment surface and atmosphere of our planet. Of course, life will continue working in this way despite our species were to disappear someday. Hence bioethics lessons learned from symbiosis concept in the microcosm also must be transferred to macrocosmic world of human cultural relations, where we inter-retro-act with ourselves, with other living species, and our natural environment. The survival of the human species and its natural environment will depend on how we manage our collective imagination the bioethics responsibility to safeguard the cosmic miracle of life.

Conclusions

From a transdisciplinary bioethics vision, we can conceive human species as the worst plague known for our environment, because since the Agricultural Revolution about 10,000 years ago, and especially since the Industrial Revolution 250 years ago, we are systemically destroying all natural resources to meet our needs as human species. In nature, organisms that are characterized by fast growth and reproduction have the fatal disadvantage of depleting resources at its disposal until the environment around become inhospitable: making impossible its survive. Similarly, guided by an ecocide and irrational "globalist-four-motor" (science, industry, capitalism, and technology), human are accelerating this process of environmental degradation with our habits of production and consumption that involve the exploitation and loss of natural resources. According to several UN reports, if we continue with this illusory trend and not perform our relationship with natural ecosystems, we are pushing billions of people into a chronic shortage of natural resources that will impede their dignified human development.

The current global citizenship must make an examination of self-consciousness to change the course of our fatalistic actions. "The real survivors are the Earth inhabitants that have lived millions of years without consuming their ecological capital, the base from which all abundance flows" remind us biologist Janine Benyus (1997: 9). Humans must learn to cooperate and collaborate symbiotically, in a similar way that bacteria have done since billions of years, in order to prevent the disappearance and extinction of biodiversity on Earth. Recognition of the role that cooperation and network collaboration have as vital phenomena for the co-evolution of species with their environment have deep bioethical implications involving a revolution of values in contemporary civilization model. While the current capitalist socio-economic order implies an irrational exploitation of natural resources through a general ecocide process of all life forms that exist in Gaia -including human species-, the concept of co-evolution represents the DNA of a new epistemic paradigm that goes beyond Darwinian conception of competition in nature. According with physicist Capra (1998: 254), "life is much less a competitive struggle for survival that the triumph of cooperation and creativity." This vision perfectly summarizes the main objective of this article of reflection: expand the bioethics notion expressed in Article 17 of the Universal Declaration on Bioethics and Human Rights by introducing the transdisciplinary approach of coevolution in Big History.

In my opinion, bioethics inspiration derived from bacteria phenomenology allows us to transgress the selfish and competitive vision of life in nature to make a

qualitative ontological shift in the forms of cooperation and coevolution that future generations will require us. I call to this symbiosis as transnational relations because they are characterized by going beyond of mere relations between countries and they integrate all living and non-living forms of Gaia. An irrefutable argument that we are arriving to this qualitative ontological shift in the paradigmatic epistemological structures of the 21st century is the fact that several Sustainable Development Goals lead by the United Nations for 2030 are including non-living parts of Gaia. I.e. SDG 6 is focused on sustainable water management, SDG 14 is directed to take care of the oceans and seas, and SDG 15 seeks to protect, restore, and promote terrestrial ecosystems. This means accepting the co-evolution as a self-eco-organization process of life autonomy and interdependence on Earth. While we can learn very little from ecosystems in terms of culture, language, consciousness, values, justice or democracy, sustainability is inherent in the patterns of a complex and subtle organization that ecosystems have learn during their long co-evolution. For this reason, the nature represents the best model of sustainable organization. Hence we have to learn from the wisdom of ecosystems, as they represent the basis for an "ecological literacy" where humans learn biomimetically to co-evolve in Gaia in a resilient and sustainable way (Collado, 2016a). A new conception of transdisciplinary bioethics seems to emerge from the biomimetic and coevolution perspective in Big History. I invite all readers to discuss more widely. Are you ready?

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