4
From Past Unaware Hominization to Future Conscious Humanization: Social Evolution in Retrospect and Prospect

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Abstract

The work offers scholars who explore alternative futures an insight into how the knowledge of past human evolution might contribute to shaping the way we think about the future and the relationship that humankind has to its futures. In this sense, it presents the bases of a potential new paradigm of social evolution by exploring possibilities arising from the forms of past social behaviour and future self-understanding. This is achieved by reflecting upon what makes us human, taking into account the key concepts of hominization and humanization, and by sharing with the readers a range of views on how elective affinity, collective individuality, complementarity, and correspondence can affect our conscious 'progress' (sensu 'directional change') towards full humanization.

Keywords: *human evolution, anthropology, ecology, sociology, futures studies.*

> ... but has also confronted our traditional view about progress and predictability in the history of life with the historian's challenge of contingency – the 'pageant' of evolution as a staggeringly improbable series of events, sensible enough in retrospect and subject to rigorous explanation, but utterly unpredictable and quite unrepeatable (Gould 1989: 14).

Introduction

About seven million years ago, the characteristics that would over time give rise to unique and diversified primates were configured (Cela-Conde and Ayala 2003). One of the branches was our genus, *Homo*. The initial stage comprised of *Ardipithecus*, *Australopithecus* and other genera than *Homo* had disappeared when our own genus emerged, more than two million years ago. In this changing scenario, there were acquired capacities that shaped a peculiar group of genera. Most of them did not manage to adapt and they were left by the wayside. Those who did adapt were transformed within the framework of natural selection until they reached the genus *Homo*, which was consolidated by establishing a relationship with the environment using exosomatic capabilities such as the production of tools and the generation and control of fire. Although human adaptations have an ecological origin, once technical systems were created, their modification seems to have overcome ecological constraints (see *e.g.,* Kissel and Fuentes 2018).

Currently, two possible models of the origin of *H. sapiens* are being considered. One model of the origin of our species is known as the multiregional hypothesis or regional continuity model. According to this model, we evolved as a species interconnected with *H. erectus*. *Homo sapiens* would not have appeared in a specific area, but rather wherever *H. erectus* lived. This species would have left Africa about two million years ago and slowly evolved into *H. sapiens* in different parts of the world. This is, consequently, a polygenic model (many origins). This model is based on several premises. One is that a gene flow must have occurred between geographically separated populations in such a way that it prevented speciation from the different populations after dispersion. Natural selection, acting on regional populations, is responsible for the ecotypes (also known as 'races') that we find today. This racial variation in modern humans would be an ancient phenomenon based simply on regional differences in *H. erectus*. This allows us to understand that diversity is what provided the real substrate for the set of evolutionary tests that finally, by selection, made some populations successful. The most accepted model at present is, however, the single origin or 'Noah's Ark' model, better known as 'Out of Africa'. According to this model, all our *sapiens* ancestors originated in Africa, where they first evolved and then, already converted into *H. sapiens*, later migrated out of that continent and went on to replace all populations that descended from *H. erectus*, without crossing with them to colonize the whole world. It is, consequently, a monogenist model (single origin). The model is based on the reproductive isolation of different populations of *H. erectus*, isolation that led to independent evolutions and separate species, such as the so-called Neanderthal man (*H. neanderthalensis*). In this case, however, there is evidence of a minimal degree of cross-linking between Neanderthals and *sapiens*, as suggested by both morphology and genomics (Bayle *et al.* 2010; Burbano *et al.*

2010; Green *et al*. 2010). The role of Neanderthals in the ancestry of Europeans has recently been addressed by Lacan *et al.* (2013), who have reviewed all the studies carried out to date on European ancient DNA, from the Middle Palaeolithic to the beginning of the protohistoric period. This small interweaving is not an obstacle to considering the hypothesis of the extinction of the Neanderthals as an integral part of the general extinction event of the Quaternary megafauna, towards the end of the Pleistocene (Hortolà and Martínez-Navarro 2013). On the other hand, racial variation in modern humans is a relatively recent phenomenon which occured after *H. sapiens* had colonised the entire world.

Affinity is one of the intrinsic properties of every system, both inorganic and organic. For this reason, we have to move forward – probably to a cosmic dimension – to find its importance as structure-interaction. However, it is clear that in our species there is no universal elective affinity between the different individuals that comprise it. On the other hand, collective individuality represents the antithesis of individualism. Individualism can be defined as the human primate behaviour in which the individual only acts and thinks for the benefit of unity, not as a structure of the community but as the survival of the individual, which is impossible in the framework of the scientific-technical revolution.

Since the 1990s, the Danish physicist Niels Bohr's principles of complementarity and correspondence have led to an intense epistemological debate which is beyond its interpretation in quantum mechanics. These principles can be applied to the conscious humanization of our species, taking into account the strong global impact of *sapiens* in the integral ecosystem we call the biosphere. This unprecedented impact would have begun with the Industrial Revolution in around 1800, giving rise to a new geological epoch which has been called the Anthropocene (Steffen *et al.* 2011).

The concept of the Anthropocene as a new geological epoch breaks with previous evolutionary schemes. According to Clive Hamilton and Jacques Grinevald):

> Earlier scientists who commented on ‘the age of man’ did so in terms of human impact on the environment or ‘the face of the Earth’, not the Earth system. Moreover, earlier Western conceptions relied on a progressive and linear evolutionary understanding of the spread of humankind's geographical and ecological influence, whereas the Anthropocene represents a radical rupture with all evolutionary ideas in human and Earth history, including the breakdown of any idea of advance to a higher stage (such as Teilhard's ‘noösphere’) (Hamilton and Grinevald 2015: 1).

This Teilhardian idea of progress can be found, for example, in the statement by Teilhard de Chardin:

> The earth was probably born by accident; but, in accordance with one of the most general laws of evolution, scarcely had this accident happened than it was immediately made use of and recast into something naturally directed. By the very mechanism of its birth, the film in which the 'within' of the earth was concentrated and deepened emerges under our eyes in the form of an organic whole in which no element can any longer be separated from those surrounding it. Another 'indivisible' has appeared at the heart of the great 'indivisible' which is the universe. In truth, a pre-biosphere (de Chardin 1959 [1955]: 74).

Our idea of 'progress', rather than a synonym for advancement, is understood as a directional change, as Michael Ruse (1996: 19) states, 'Progress implies that there is change in a certain *direction*'. Humankind's progress, identified with an unquestionable 'advancement', is implicit in transhumanism. This (currently in fashion) movement encourages our future evolution by applying scientific and technological developments leading to a 'posthumanity'. Its history and discussion can be found extensively elsewhere in the specialized literature (*e.g.,* Birnbacher 2008; Bostrom 2005; Cordeiro 2014; Evans 2015; Hansell and Grassie 2011; Harrison and Wolyniak 2015; Lilley 2013; Miah 2008; Stambler 2010).

In this work we present a series of reflections on what makes us human, taking as a guide the key concepts of hominization and humanization. Afterwards, we share with the reader a series of points of view on how elective affinity, collective individuality, complementarity and correspondence can influence our conscious process towards full humanization. In general, this work offers scholars who explore alternative futures an insight into how knowledge of past human evolution might contribute to shaping the way we think about the future and the relationship that humankind has to its future. In this sense, it presents the bases of a potential new paradigm of social evolution by exploring possibilities arising from the forms of past social behaviour and future self-understanding.

Hominization, or Our Pre-Humanization

Hominization is a biological process in which a series of morphological and ethological changes in the primate order generated a structure with enormous evolutionary potential. In this process, in addition to the genetic material that carried the information, the continuous change in the ecological conditions to which these primates had to adapt for the survival is a landmark in human evolutionary history (*e.g.*, Hardt T., Hardt B., and Menke 2007).

The concept of hominization acquires strategic significance for two reasons. The first reason is that it helps to give us an evolutionary overview of our genus. The second reason is that it places us in the phylogeny of the set of genera that make up hominins before human culture existed, and therefore are not demarcators of what is characteristic of the set of species that make up our genus. From the outset, this process over millions of years helps us to understand what biodiversity and specific diversity mean. In this entire seminal set, there are ethological characteristics that explain the behaviours that we have systematized but that originated many hundreds of thousands of years ago when our ancestors were still small bands on the African savannahs. The high and specific capability for socialization in hominins (whether in forested environments or in open spaces) was fundamental for survival in selective pressure conditions.

In the long human process towards humanization, hominization has experienced a series of acquisitions (or refinements of previous acquisitions) that have made our current uniqueness possible. The most relevant of all the acquisitions may have been the allometric growth of the brain. This acquisition does not occur in any other genus in our family. The role of the brain in our ability to adapt and survive is a shared epiphenomenon. However, we share this ecological standing position with other primates. It was essential for us to maintain it when we left forested areas about three million years ago, although in other species of hominins this capability did not serve to prevent their extinction. This shows that the process of hominization is another trial that favours the possibility of the survival of the species. But only those who have managed to integrate several adaptations and to synchronise them have been able to challenge natural selection and survive under this pressure. This phenomenon of change occurred due to a process of adapting from life in the jungle to life in the savannah. Our brain began to grow faster than in other primates about two million years ago. About a million years later, it was already 1,000 cubic centimetres. The highest value (1,550 cubic centimetres) was reached by the Neanderthals nearly fifty thousand years ago. In our species the average is about 1,400 cubic centimetres. In other words, most recent humans (Neanderthals and *sapiens*) have a cranial capacity with a volume of about a litre and a half. In this sequence, the consumption of meat protein is of paramount importance. Previously, our ancestors were frugivorous and folivorous. The increasingly frequent use of tools in our activities, and soon language as well, which may be a characteristic of our genus and not only of our species, configured a new evolutionary reality that eventually gave rise to *sapiens*.

Hominization is a very high contingency process. Without our precision grasp, without our high cranial capacity, without our consolidated erect position, it is possible that our genus would have followed the path of the genera with which they coexisted and that disappeared at the end of the Pliocene or beginning of the Pleistocene, in many cases due to the lack of these characteris-

tics. From *H. rudolfensis* and *H. habilis* until now, a number of basic characteristics have revealed how the substrate of our genus was produced. The fact that some basic acquisitions are shared diachronically indicates precisely the importance of change when the process of humanization gained strength and gathered more momentum than that of hominization. Indeed, *H. ergaster*, *H. erectus*, *H. antecessor*, *H. neanderthalensis* and *H. sapiens* share this set of qualities with *H. sapiens* integrating and expanding upon and, thus, transforming us into an unparalleled primate. The structural break with the parsimony that occurred in the adaptation of other hominins, placed us ahead in the race towards the acquisition of a cosmic consciousness.

What made hominins break with hominization in the strictest sense and begin to move towards humanization? This is a substantive issue to be resolved. If we understand full humanization as consciousness, one can say that between a million and a half million years ago there appeared a new characteristic that marked us forever and that is at the base of the evolutionary trial of *sapiens*: humanization.

Humanization, or Our Post-Hominization

The concept of humanization is a key aspect in the subject of human evolution and, perhaps, in the evolution of life as a whole. Humanization, as a systemic structural acquisition, represents a cosmic awareness, a composite and multiform singularity of acquisitions that have allowed us, over time, to break with the inertia of the past and surpass natural selection to delve into what is currently unknown. It is essential to understand the initial concept that gives us the substratum of knowledge through which the process of humanization was possible, and which, therefore, places us right at the beginning of the entire human enterprise. Evolutionary paths, although containing sudden changes, tend to be long and loaded with inertia. The process of hominization does not escape the universal law of parsimony that characterizes the existence of life.

Were *rudolfensis* already humanized or were they still being hominized? Is consciousness the fundamental acquisition? If so, *erectus*, *heildelbergensis*, *antecessors* and Neanderthals would already be species in full humanization. Here we will limit ourselves to addressing the problem regarding *sapiens*. From the current perspective, we understand 'humanizing' as the process of evolutionary singularity that has led us to operative awareness. Humanization is the emergence of operational intelligence, the product of socialization. It is the acquisition of the ability to think about our intelligence, to understand the process of life and to adapt to the environment through knowledge, technology and thought. Humanization is represented in the history of our humankind through different social formations that have been evolving arborescently in the different terrestrial ecosystems and characterizing the behaviour of species until today. At any given space and time, human coordination through social relationships of production is characterised by the exploitation of a territory, as well as by the way in which the organization of *sapiens* populations is expressed.

Humanization shows its specific features in different ways in which populations are structured and the way in which acquisitions were applied to adaptation and survival. Different analytical units into which social formations have been divided according to their economic bases explain and describe humanization beyond acquisitions. They are the result of the integration of different cultural acquisitions and the space in which they are expressed. This opens up a horizon of epistemological realization. Defining humanization is a priority objective to complete the theory of evolution. The concept of humanization is broad and inclusive enough 'to open the door' to critical reflection, difficult to tackle but necessary.

Elective Affinity, or the Chemistry of Human Relations

'Affinity' is a term with a long alchemical tradition, the use of which dates at least back to Albertus Magnus in his *Liber mineralium* (Newman 2012). The notion of elective chemical attractions was applied to human relations by Johann Wolfgang von Goethe based on the work *De attractionibus electivis*, by the Swedish chemist Torbern Olof Bergman (Asendorf 1993 [1984]: 159). In fact, in his homonymous novel *Die Wahlverwandtschaften* [Elective affinities], Goethe (1994 [1809]) resorts to chemical affinity as a metaphor for romantic relationships (Duran 2011; Joly 2006).

All humans are made up of the same materials. We have a shared protein coding system and we survive socially on the same planet in the framework of similar ethological and biological structures. There is a physical and chemical impossibility that, without interactions of this order, makes survival unattainable in a changing environment. Thermodynamically, in order to maintain a living system, it must be in some measure open to the exchange of energy. According to Erwin Schrödinger, 'What an organism feeds upon is negative entropy. Or, to put it less paradoxically, the essential thing in metabolism is that the organism succeeds in freeing itself from all the entropy it cannot help producing while alive' (Schrödinger 1967 [1944]: 76). In addition, biosystems also need this degree of openness to have the response capability necessary to evolve. Evolution is something consubstantial to the dynamic functioning of the planet, and this dynamic subjects individuals to a selective pressure that would be completely unbearable without the cooperation effected through elective affinity. Cooperation between individuals structured the ability to build phylogenies. With the advent of life on the Earth, microscopic organisms needed affinity to establish exchanges and avoid becoming closed systems without the possibility of finding new shared acquisitions to get ahead. Cooperation and symbiosis explain affinity as a seminal global process. Otherwise, life would be impossible.

The basis for the increase in diversity is part of the organizational memory of the system. Quantity and quality are, in turn, part of the strategy of the system, a strategy that generates and eliminates organisms as a consequence of the

consistency of the living beings that comprise and structure it. With different strategies due to stochastic processes of genetic mutation, biocenosis allows us to increase and decrease in quantity and quality and, with this cyclic movement, it acts as a non-directional but effective test for the species, genera and families that constitute it. According to Jacques Monod (1972 [1970]: 43), '[the biosphere] does not contain a predictable class of objects or of events but constitutes a particular occurrence, compatible indeed with first principles, but not *deducible* from those principles and therefore essentially unpredictable'. Affinity is useless when the system collapses because of a change or transformation resulting in the loss of organisms' thermodynamic horizon. A catastrophe or radical transformations of humidity and temperature are factors that deconstruct media and alter behaviours until the processes of growth and reproduction become unfeasible.

The principle of natural selection (Darwin and Wallace 1858) shows how we have become competitive in order to get ahead, given that we are part of the planetary biocenosis and that we are bound by its basic laws. Subjected, like all organisms, to the laws of natural selection, we have applied the principle of competitiveness in all areas and at all levels. This has kept us alive until now. Thanks to this mechanism, we have become the most competent organisms in the primate zoological order. We have combined all possible strategies to become as capable as we now are. However, we must prevent competitiveness from replacing competition in this race to adapt to the planet.

This is an opportune time to talk a bit about sociobiology which is a synthesis of scientific disciplines that attempt to explain animal behaviour considering the neo-Darwinian advantages that specific behaviours can have. It is often considered as a branch of biology and sociology, but it also falls within the fields of ethology, anthropology, evolution, zoology, archaeology, population genetics and other disciplines. In the study of human societies, sociobiology is closely related to the fields of human behaviour and evolutionary psychology.

Sociobiology investigates social behaviours such as mating patterns, territorial struggles, joint hunting and societies of social insects (Wilson 1975). Selective pressure leads to the genetic evolution of advantageous social behaviours. The postulates of sociobiology have become one of the great scientific controversies of the past century, especially in the context of the explanation of human behaviour. Applied to other animals, they have not been a matter for debate. The most notable criticism was made by Richard Lewontin and Stephen Jay Gould (see *e.g.*, Gould 1988a; Lewontin, Rose, and Kamin 1984) and focused on the containment of sociobiology in the definitive role that genes have in human behaviour and in which the traits such as aggression can be better explained by biology than by the personal social environment. However, many sociobiologists mention a complex relationship between nature and nurture. In response to this controversy, John Tooby and Leda Cosmides (1990) initiated

evolutionary psychology as a branch of sociobiology. This discipline is less controversial, as it covers issues of human diversity.

Now that we are aware of many mechanisms for sharing energy, knowledge and everything that keeps interactions on the planet alive, we cannot think of another way to change competitiveness for competition other than to intellectually construct elective affinity. All living beings appear as a result of a process of synthesis. Space and time are dimensioned and diversified within the framework of uniqueness, variability and diversity. This gives rise to multiplicity, and it is in this context that our evolutionary specificity emerges. Without elective affinity, it is very possible that there would be no increase in sociability. Affinity is a phenomenon of interactions of the same system that has been fundamental for survival and biotic evolution. It is necessary to be aware of this quality, which can be cultivated but that arises from the natural environment to be critically applied in the historical environment. Affinity must be understood as an expression of the ability to give and receive energy, both bidirectional and multidirectional. Giving or receiving energy does not involve compensation, except that such compensation is a kind of altruistic affinity. It is not about finding artificial means of connection – considering as such the intellectualization of the concepts in all kinds of ways – but about redundancy and critical formulation of the natural foundations that have been tested in the evolutionary process itself. The question is to stimulate a collective reflection which can come from mere intuition and arises as a result of mechanisms ruled by the properties of living matter. Elective affinity should not come from a metaphysical abstraction but from a physical projection that, in turn, is based on the dialectic of nature itself, as the composition of an established systemic property.

Actualism is the principle according to which the geological and biological processes of the past can be explained by the same causes as those of the present (Podgorny 2005). Its antithesis, catastrophism explains the current natural world as the result of radically different processes such as the universal flood (Birks and Birks 1980: 7). Many ultra-Christian sects still see in catastrophism the best explanation about the changes in species as opposed to evolutionism (Hortolà and Carbonell 2007). Actualism acts as a regulative hypothesis in all sciences that deal with the past and where the object of study is, therefore, beyond the scope of direct observation. Applying information from the current perspective reveals that a work team is only ensured of adequate personal and social performance thanks to elective affinity because there is no loss of energy in any direction. Nevertheless, such a team must be understood as a creative process of collective individuality. It should not be considered as part of the situation of the 'proletarianization' of the scientific profession, as claimed by Jean Marc Lévy-Leblond (1972) 'One cannot separate the scientific knowledge produced by science from its mode of production' or according to Javier Echeverría (1989: 240), 'Considered as one of the main engines of economic progress and social

development, current science ceases to be a liberal profession to be socialized to a high degree' [own translation from the original version in Spanish]).

Energy is always maintained within the system because everything is related to it. To avoid the loss of efficiency and efficacy, to ensure the continuous recharge of all the units of the system, it is necessary to share it. Only elective affinity enables us to maintain a consistent interaction. It is not that seeking elective affinity is part of building intersocial relationships, but that it is part of the same system. Not looking for it means breaking with something very positive and very longstanding; it must be adapted to our objectives.

Homo sapiens is a unique expression of the evolutionary possibilities of matter-energy in the solar system and elective affinity is necessary to establish a process of approaching matter. The great amount of existing energy could not be expended without elective affinity to justify it. The social use of elective affinity is also a product of natural selection. Technical selection became more sophisticated for the benefit of the species itself although humans have not specifically recognized it.

In the absence of knowledge, educating society on the issues of elective affinity is difficult and expensive if we do not pay attention to who we are and what is happening to us as a species on the planet. Without prior knowledge, our reflection on ourselves is not sufficiently rigorous or committed. Elective affinity has no value. It is a characteristic that must be developed within the framework of critical species consciousness if we think that, as such, it is worth knowing who we are, to do what is most beneficial for all.

Collective Individuality, or the Power of Social Networks

The idea of a 'collective individuality' as a fusion of individual thoughts appears in one of the seminal works of sociology, *Les règles de la méthode sociologique* [*The Rules of Sociological Method*] by Émile Durkheim,

> By aggregating together, by interpenetrating, by fusing together, individuals give birth to a being, psychical if you will, but one which constitutes a psychical individuality of a new kind. Thus it is in the nature of that individuality and not in that of its component elements that we must search for the proximate and determining causes of the facts produced in it. The group thinks, feels and acts entirely differently from the way its members would if they were isolated (Durkheim 1982 [1895]: 129).

Collective individuality is an emergent property of our species, and one should consider it if we want to understand it. Actually, we now have the tendency to analyze this phenomenon from an idealistic perspective instead of from the new emerging reality. Blind individualism is one of the most important problems that our evolving species is currently facing. Individuality is

not spoken of as a collective process of individual awareness, but as the social fragmentation of human populations. This interpretation needs to be informed and understood within the framework of evolutionary and conceptual criticism, so as to avoid the mistake of undertaking a subjective and possibly incorrect social analysis.

According to the popular conception, individuality, converted into individualism, is a consequence of the poor social and economic evolution of humans. Breaking with this vision can help us to redirect social analysis and facilitate a progressive vision of individuality as a phenomenon of social organization within the framework of technological humanism. The set of social relationships comprising production and consumption that have been created makes it impossible for the individual to be individualistic.

The individuals' ability to provide information from his or her perspective can socially improve the species. The interaction between each of us and the collective self is an aspect that cannot be ignored in almost any aspect of our existence (Spears 2001). An individual of our species without a place in a family or a group formerly had no chance of survival. What ensured the survival was the group; now, this function is increasingly taken over by the State, the community and, ultimately, the species as a whole. This individual-species relationship is fundamental and possible thanks to the social services that our evolution has made possible: social security, geriatric centres, health services, *etc.*, which were inconceivable in other types of social formations prior to the industrial and scientific and technological revolution. And they were not necessary; the nuclear family ensured intergenerational well-being. A society that organizes production and consumption based on technology favours the accumulation of energy, which is then used in services. Without producing a significant energy surplus, it would be impossible to maintain human populations, which have reached exponential growth.

The scientific and technological revolution makes new forms of domestic and social organization possible; forms that, until recently, before this economic and social acquisition took place, were unimaginable for us as human primates in the process of humanization. The specific acquisitions that are socialized in the framework of this last great revolution, allow the establishment of unexpected intra-specific relationships.

The concept of collective individuality introduces us into a new species' dynamics in which individuals can organize the society through their collective freedom. If we were not a collective of individuals, it would not have been possible to generate the economic and cultural social conditions necessary for individual emancipation. From this perspective of individuality as an evolutionary process of the organization of a population, one can also consider the social organization of the future, considering this emergent characteristic and demarcating it as an objective phenomenon instead of an ideological subjectivity.

Community as a human aspect is not exclusive to our species, although other animals could not increase their sociability due to the difficulties in their adaptation which is almost always endosomatically. This human singularity within the great adaptive singularity has allowed our processes and our acquisitions to move away from linear increment parameters and transform themselves into evolutionary parameters that have led to exponential growth. Thus, our system must be explained by nonlinear equations. Within this context, it is very difficult to make a prognosis about how the concept of 'collective individuality' will end up articulating the changes and acquisitions of our species. It is important to bear in mind that we do not know how human adaptation behaves in terms of exponential growth such as those that our species is now experiencing. It is very possible that collective individuality will lead to the process that will give rise to new types of collectivity different from the sociability that, by nature, human primates have been enjoying since we were simple bands wandering through the African savannahs at the end of the Pliocene.

The structuring of collective individuality is an emerging reality. Education and training are being transformed into scientific knowledge, so our species is socialising it in a different way. We developed new ways of thinking and adapting, and these new styles carry in their midst the human capability for unlimited knowledge and for coordination which has never been achieved before.

The issue of complex networks has aroused a growing interest in the academic world among scholars, from ecologists to neuropsychologists. The connection of individuals in social networks of knowledge and thought is generating a framework in which distinguishing the individual contribution is difficult. The goal of social networks is to offer a place for virtual interaction where millions of human beings from all over the world share common interests. According to the sociologist Duncan J. Watts (2003), anyone on the planet can be accessed in six 'jumps'. This idea had already been proposed many years ago by the Hungarian writer Frigyes Karinthy (2006 [1929]). Among friends, family and colleagues at work or study, each person knows about 100 people on average. If each one is related to another hundred people, any individual can spread a message among about 10,000 people, if he has previously asked each of his 100 initial contacts to, alternatively, pass the message on to his own contacts. Networks will be able to organize changes and transformations, and mitigate high-intensity human resocialization. These realities will make social products even more technological and cultural. However, we must first resolve the conflicts between science and anti-science (Dunbar 1996) because such discord can compromise our own survival. Finally, we, as a species, can become the network itself, as well as the way to implement the social application of knowledge through science and technology.

Complementarity, or Survival Insurance

The survival of living beings is often not possible without complementarity. And, without having assured survival, diversity would be unthinkable; life, as we know it, would not exist. Complementarity is at the nexus of the concepts that explain behaviour and thus provide indications for our social behaviour. Therefore, it must be analyzed in order to achieve systemic apprehension.

The properties resulting from the evolution of the environment show once again that intellectual behaviours take place in the dimensional nature of space-time, and that we must be able to make them function in our practices as a species through knowledge. Complementing gives rise to the situations of integration and convergence among individuals of the same species, between species or between genera and families; it ultimately consists of new syntheses to organize and regulate energy in a way that ensures, in many cases, the convergence of intra-specific or extra-specific processes that occur in nature.

Without biological, ethological, cultural or sexual complementarity, it would be difficult to understand the evolution of many populations and the ways of life that are known to us. Therefore, the systemic analysis of the trophic interrelation and biocenosis at a given moment in history brings us closer to the understanding of the forms of complementarity that exist as well as the benefits that can be derived from them. Be it from the perspective of commensalism or other types of behaviours that exist and that explain the forms of complementarity, these behaviours indicate the moments of evolution in which this type of relationship was necessary. In order to show the importance of the categories that comprise the megaconcept being described, we have chosen the most integrative and basic complementarity in reproduction processes: the sexual complementarity that is so efficient in the biological and social reproduction of different families of animals and plants. Although complementarity is not a basic adaptive property throughout the world, without this type of complementarity the variability and diversity of the planet would not be assured. With fertilization, the integration of a sperm cell within an ovum quickly leads to the beginning of an exponential process of cell generation until an embryo is formed. Sexual complementarity is the basis for the reproduction and parental care scheme in terms of costs and benefits, which has a very close relationship with the *K*- or *r*-species strategy, as conceived in population ecology (see *e.g.*, Green 1980; Fix 1999: 3–6; Reznick, Bryant, and Bashey 2002; Klug and Bonsall 2010). Sexual complementarity facilitates the defence of breeding in the face of predators and, in general, the environment. At the same time, the sexual organs also often need complementarity, because in the social sphere the specific cooperation of the parents is needed as well. This is the strategy that nature has developed for the continuity of life and, therefore, it shows the importance of complementarity in general, and in particular for mammals who, like humans,

have a very long childhood and thus risk of becoming easy prey for predators. Complementarity is the foundation of the trophic chain. It is one of the basic emergent properties for many of the interactions that make living systems adapt to changes and thus reinforce the bonds that enable the existence and generation of diversity.

In the field of social networks, complementarity serves to create an infinite space of connection and knowledge; it is also about inter-complementarity, and in many cases it leads us, voluntarily or involuntarily, to a mode of interdependence. In this conceptual structure, we will explain how this facilitates the relationship and the passage of energy between the neuronal axons of populations, groups and living societies. The division of labour, the organization of sequencing and chains of work are based on complementarity; therefore, it has the same basis as our social manner of relating as a species. We could say that complementarity is already specifically human in terms of how we have socialized it.

Like a working brain, the whole is complementary to the parts and all of them are conceptually integrated. And through this, life is perpetuated, and surely thanks to this there is an exponential increase in knowledge that leads us to intelligence. We cannot ignore the complementarity in the organization of the future of the species. It would be a serious error that surely would not allow us to turn back, now that we are in very delicate times in which time and space are merging in a terrifying dynamic. We would have to incorporate the concept of complementarity into the type of convergence that we propose in order to strengthen all the organizational and explanatory power that it contains.

Our complementarity starts from our owneukaryotic cells. The endosymbiotic theory was presented by the American biologist Lynn Sagan (later Lynn Margulis) to explain the presence of intracellular organelles with their own genome in eukaryotic cells (Sagan 1967). The organelles, the mitochondria and the chloroplasts (these last ones exclusively of plants) initially were bacteria installed by symbiosis inside a primitive eukaryotic cell. Over time, a part of the genes of the symbionts transferred to the genome of the host cell and only a small part remained in the original genome of the symbiont. Some of the tests that support this theory are the presence of bacterial-type ribosomes inside the mitochondria and plastids. The genome of these organelles is organized in the same way as the genome of bacteria: circular and free, without a covering. The structure of lipid bilayers is similar to that of bacteria. More daring were the arguments that Lynn Sagan/Margulis and her collaborators sustained when attributing the symbiotic origin to the flagella and the nucleus. Thus, although the validity of this theory for the origin of mitochondria and chloroplasts is currently accepted, there is insufficient evidence to apply it to other cell organelles as well.

Correspondence, or the Experiment of Humanization

From the point of view of scientific method, examining the correspondence between a hypothesis and its testing is a valid strategy for approaching to 'scientific truth'. It enables to address problems with the assurance that, alternately, there will be complicity between the interacting subjects and that the action-reaction will work. It is therefore evidence of self-confidence, which is necessary for the great transformations that humankind will have to face during social and technological evolution. In the introduction of his influential book on the cultural evolution from egalitarian hunter-gatherer groups to hierarchical states, Marvin Harris writes,

> My purpose in this book is to replace the old onwards-and-upwards Victorian view of progress with a more realistic account of cultural evolution. What is happening to today's standard of living has happened in the past. Our culture is not the first that technology has failed. Nor is it the first to reach its limits of growth. The technologies of earlier cultures failed again and again, only to be replaced by new technologies. And limits of growth have been reached and transcended only to be reached and transcended again. Much of what we think of as contemporary progress is actually a regaining of standards that were widely enjoyed during prehistoric times (Harris 1991 [1977]: x).

In the period of social acceleration similar to the one that has caused the exponential evolutionary vibration, correspondence can at all times support and help us to find ways to establish relationships that generate positive syntheses. We speak of syntheses precisely because of the social force that correspondence could have as a process of adaptation. Correspondence also exists because it is necessary to ensure the proper functioning of structures and systems. When analyzing this concept, we understand many of the relationships that exist in nature and that make our adaptation possible. In the words of Pyotr Kropotkin (2009 [1902]: 223) 'The mutual-aid tendency in man has so remote an origin, and is so deeply interwoven with all the past evolution of the human race, that it has been maintained by mankind up to the present time, notwithstanding all vicissitudes of history'. As Gould (1988b) notes, apropos of Kropotkin's thought, 'Struggle does occur in many modes, and some lead to cooperation among members of a species as the best pathway to advantage for individuals'. The pathways of social evolution are unquestionably diverse. According to Dmitri Bondarenko, Leonid Grinin and Andrey Korotayev (2002: 54), 'there are reasons to suppose that an equal level of sociopolitical (and cultural) complexity (which makes it possible to solve equally difficult problems faced by societies) can be achieved not only in various forms but on essentially different evolutionary pathways, too'.

Artistic sensibility is not alien to our environmental perception. In this sense, Tonia Raquejo states that 'Ecological awareness emerges both from the

data obtained through the scientific analysis of our biosphere and from emotional factors of psychic dynamics which anticipate a changing and uncertain future, thus forging a collective imaginary based on fictional projections, often inspired by theories of science itself' (Raquejo 2015: 57) [own translation from the original version in Spanish].

We should intervene in our nature through our ways of knowing and being with all the means at our disposal. As social animals, we are capable of consciously intervening in our environment, and we need to consider how to self-modify. As soon as cultural selection replaces natural selection we will complete the process of humanization. Therefore, although becoming human is an experiment of nature in which we are the raw material and at the same time the active agents, we can pose categories that help to understand ourselves as a self-experiment. In this dialectic, where subjectivity clashes with objectivity, one can obtain the framework of a new evolutionary conception of ourselves. And we can escape the alienation we experience when we think there is a teleonomic structure that determines our process of adaptation and that we can head only in this direction. Our humanity, then, only makes sense if we are able to subtract to randomness. On the other hand, becoming human is also the awareness that we have about our own evolution, far from theologies and teleonomies. The explanatory fact lies in how we have learned to know, to think and how we have created the knowledge and thought that exists in our brains and that, therefore, is structured diachronically in the human mind.

A large part of the things that can happen is in our hands and gives us a possibility that has never existed in nature, at least as expressed in us, *Homo sapiens*. The central idea of the recent concept of the Anthropocene is that humans, in competition with other natural forces, are effecting profound changes in the physical processes of the Earth (Nordblad 2014). The concepts that we are integrating into our behaviour bring reason and logic to the fore and open the way to hope. This is how we can make the necessary reflections that maintain, organize and direct the flow of our own manifestations: self-control through knowledge and its social application to the species.

The theory of evolution has obviously helped us to learn about our origins and to decipher the process of adaptation, so we managed to compare it with other living organisms with which we co-existed and will coexist for a long period of time. This ability to know thanks to the theory and concepts that explain reality makes us a reality in permanent construction. It seems like an objective fact, and it is from this objectivity that we can systematically analyze our subjectivity. Thus, we have the possibility of conducting an artificial test based on natural knowledge and its social application.

Our species wants to be in permanent construction, pursues self-awareness and self-knowledge, and ultimately does not avoid self-experiment. It is very

likely that through this exercise we will be able to become humans. We do not need to challenge our limits by stimulating the way we acquire our awareness of space-time. Today, paradoxically, this is what gives us the uniqueness of humans, just as it puts obstacles in the process of humanization. Surely, it is the limiting factor that we cannot challenge without risking what we are and what we want to be. However, we cannot forget the constraints imposed by the state-of-the-art of our knowledge of human evolution. We must agree with Ruse when he says,

> I admit that it would be naive indeed to suggest that we are close to a full understanding of human nature from an evolutionary perspective, or even that we will ever actually complete a full understanding. (...) To try to achieve in human evolutionary biology such predictive accuracy as we find in physics probably demands such a constriction or narrowing of focus in the very effort that one necessarily will ignore the full experiential richness of the human condition (Rose 2000: 23).

The critical consciousness of our species helps us to do things because collectivity is taken into account and provides a useful framework for responsible evolution. In this process, we forecast a probable phase change in which integrated diversity will give rise to a new type of adaptation as a real possibility. It will be a structural acquisition that can lead us towards trans-consciousness; later, we will realize that the process of humanization is left behind and that we have begun building the world in a different way. The importance of becoming human is to realize that humanization is possible and to be aware that, we can take a leap towards a type of knowledge and consciousness that we have not known until now. For this reason alone, it is important to recognize ourselves in the collective experiment of humanization. To become human is not a chimera, not even a utopia, it depends on us, on our will and on our ability to know, think and act with the critical conscience of a species.

Conclusion

In the process of human singularity and its evolutionary substratum, hominization and humanization are two sides of the same coin. Without hominization there can be no humanization; without humanization there can be no awareness of ourselves from the perspective of questioning who we are and where we are going. Hominization and humanization are integrated: humanization is a consequence of hominization. This also explains evolutionary conditioning. Moreover, the dependence of one upon the other opens up the possibility of making an evolutionary and critical interpretation of ourselves, outside idealistic or mythical attempts at explanation. Humanization can be defined in

many different ways, but they all express the way in which the singularity of the genus and the species manifests itself. The biological in many cases is able to determine what is cultural, but the synthesis represents a form of integration without which humanization would be a chimera. Without a social theory of evolution, humanization would be a concept vaguely explained and undefined despite the analytical intensity that surrounds it.

The collectivization of energy is very likely leading us towards a new social paradigm in which the individual is strongly bound to his or her own community. Once we determine what is meant by collective individuality, one should look at how it can be implemented without subjectively generating structures and individualistic systems. Without elective affinity, this type of process is unlikely to take place. Perhaps we are not yet accustomed to such kinds of processes because our ethological behaviour marks us with basic principles when it comes to action. However, one should think of culture as a more sophisticated mechanism so as not to disregard human properties as necessary and beneficial to elective affinity. The crucial role of culture in science was previously emphasized by Ruse (1999: 246–249) who states that 'Through the metaphors of culture, predictions are made possible' (*Ibid.*: 246), and that 'Complementing the Kuhnian spin on science conferred by the metaphors of culture is a Popperian dimension' (*Ibid.*: 249). Nevertheless, culture does not inevitably import 'a value component' into science (*Ibid.*: 246).

We must be aware that unless we significantly change our current behaviour as a species, we run the risk of carrying out wrong actions that may lead us to collapse and extinction. Homogeneity can serve to organize and extend knowledge more quickly, but it is equilibrium and, as such, not intending to change the structure or the system, leads to stasis. It can become thermal death. What helps us is the difference. It is in the difference where complementarity plays a well-defined role in the structuring of life: biological, social, and sexual. It is within the framework of the needs of current species that we can find the educational reference to strategically incorporate the concept of complementarity. It is not about good intentions, but about human determination and irreversibility in a strategy in which we have to substantially revise the reason why we have not taken advantage of properties that exponentially increase sociability and structure energies in a more efficient way.

Can a future society reach a state of absolute perfection? To answer this question, it is useful, as a metaphor, to consider the final fragment of a fantasy tale by Bruce Elliot,

> The doctor's voice suddenly failed him. Acleptos backed away from the table. Ttom gasped. Only the robots were unimpressed.
>
> For the thing was changing. Wherever the lambent light touched the creature, its scales fell away.
>
> The doctor gasped to the robots, 'Release your hold'.

> As they did so the creature arose in glory. A golden light played around its suddenly soft, sweet face. It stepped away from them towards the window. Standing on the window-sill, a smile played around its lips like a valedictory. It poised there for a moment and then spread its huge white wings.
>
> It said, 'Pax vobiscum'. The wings swirled and it was gone, wrapped in serenity.
>
> That is why Acleptos changed the words of the motto in front of the Sane Asylum. They now read: A DEVIL IS JUST A SICK ANGEL.
>
> Of course, the Machine has stopped. For its basis and its strength was infallibility. And it was wrong about the thesis concerning the existence of God with a capital G (Elliot 1951: 48).

Social prospective, as an anticipation of the future of humankind, always represents a discipline with a high degree of contingency. We know that in times of change – and, to some extent, the changes are taking place all the time – we tend to demonize what is unknown to us. Consequently, perhaps the 'demonic' social prospective is simply a 'sick' angel.

Acknowledgements

This work was supported by research grants MINECO/FEDER CGL2015-65387-C3-1-P (Government of Spain/European Commission) [EC, PH], MINECO CGL2016-80975-P (Government of Spain) [PH], AGAUR 2017 SGR 1040 (Government of Catalonia) [EC], and AGAUR 2017 SGR 859 (Government of Catalonia) [PH]. IPHES is a CERCA centre partially financed by the General Directorate for Research of the Government of Catalonia.

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