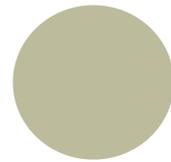


Anabel Paramá Díaz
Enrique Fernández-Vilas *Editors*



EVOLUTION OF THE BIOSOCIAL WORLD

*Biosocial World: Biosemiotics and
Biosociology*



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The concept of the biosocial world represents a foundational shift in understanding the human condition, moving beyond traditional dichotomies that separate biology from culture, nature from nurture, and the physical body from the social mind. This paradigm posits that human life is constituted through a continuous, dynamic interplay between biological processes and social structures. The evolution of this biosocial reality is not a linear narrative but a complex tapestry woven from threads of genetic inheritance, environmental pressure, cultural innovation, and historical contingency. To comprehend its grandeur requires an integrative intellectual framework, one that deliberately transcends the confines of any single discipline to embrace the rich insights offered by a consortium of the natural sciences, social sciences, and humanities. It is at this fertile intersection that the most profound explanations for who we are and how we have come to be are found.

A purely biological perspective, rooted in the principles of evolutionary theory, provides the essential substrate for this inquiry. It elucidates the slow, iterative processes of natural selection that shaped the hominid line, culminating in the emergence of *Homo sapiens* with our distinctive capacities for complex language, abstract thought, and hyper-sociality. This viewpoint highlights the deep-time evolutionary adaptations—such as bipedalism, encephalization, and neoteny—that form the universal biological heritage of our species. These are the fundamental constraints and enablers that underpin all human societies. However, while indispensable, this lens can risk presenting a deterministic or adaptationist narrative, potentially overlooking the rapid, non-genetic dimensions of change that have come to dominate the human story, particularly in the recent millennia.

It is here that the social sciences—including anthropology, sociology, and archaeology—offer a critical corrective and expansion. They demonstrate that with the development of culture, humanity entered a novel phase of evolution where social learning and symbolic systems began to exert a powerful selective pressure of their own. The advent of agriculture, the rise of urban settlements, and the formation of complex political economies are not merely cultural artefacts superimposed on a finished biological product; they are active forces that have reshaped human biology

and psychology. For instance, the domestication of plants and animals altered human diets, disease landscapes, and social hierarchies, creating new biosocial realities. These disciplines thus illuminate the feedback loops where social organizations influence, and are influenced by, human biology.

Complementing this, the humanities—for instance history, philosophy, literary studies, and ethics—provide an indispensable qualitative depth and a critical reflexivity. They insist on the centrality of meaning, agency, consciousness, and moral imagination in the biosocial equation. While science can describe the neurophysiological correlates of an emotion, it is the humanities that explore how that emotion is conceptualized, valued, expressed, and narrated within specific cultural and historical contexts. They examine the lived experience of being human in a biosocial world, asking not only "how" things function but "why" they matter. This perspective challenges reductive explanations by foregrounding human intentionality, the power of ideology, and the historical particularity of events that defy general laws.

The true power of the biosocial approach emerges from the deliberate synergy of these perspectives, where they act not as competing accounts but as complementary layers of explanation. For example, understanding the global obesity pandemic requires more than a biological model of energy homeostasis; it demands an analysis of the "obesogenic" environments created by capitalist food systems, the social determinants of health, and the cultural narratives surrounding body image and consumption. Similarly, studying phenomena like warfare, altruism, or kinship necessitates a dialogue between evolutionary psychology, political science, economics, and ethical philosophy. This interdisciplinarity reveals that human traits are not fixed essences but potentialities whose expression is deeply contingent on social context.

This integrated framework allows for a more nuanced examination of key transitions in human history. The Neolithic Revolution, for instance, can be reframed not simply as a technological shift but as a profound biosocial transformation. It reconfigured human relationships with other species, altered pathogen evolution, cemented gender roles through new property relations, and ultimately laid the groundwork for the state-level societies that define the modern world. Each of these aspects demonstrates the inextricable weaving of the biological and the social, a co-evolutionary process that accelerated dramatically with the capacity for cumulative culture.

In the contemporary era, characterized by the Anthropocene, the biosocial perspective becomes ever more critical. The human species has become a planetary-scale geological force, driving climate change and a sixth mass extinction. These environmental crises are inherently biosocial: they stem from specific economic and political systems, yet their consequences are profoundly biological, threatening food security, spreading infectious diseases, and creating new forms of social vulnerability

and inequality. Addressing such challenges requires a holistic understanding that bridges climate science, economics, political ecology, and environmental ethics, acknowledging that technological solutions are insufficient without a concurrent transformation of the social structures and values that produced the crisis.

The editors

Cultural Groups Evolution: Dual Inheritance, Mental Simulation and Language

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Abstract

In this chapter I discuss the phenomenon of cultural groups evolution based on the theory of dual inheritance. I wish to argue that this theory would be strengthened and complemented by integrating a conception of the role of mental simulation and language. I will also show how languages are good examples of how biological and cultural dimensions interact causally and mutually enhance each other, exemplifying the mechanisms underlying the cultural evolution of groups.

Keywords: cultural evolution, dual inheritance, mental simulation, language.

Although biological evolution, based on the various mechanisms of natural selection, has been studied in detail, the evolution of culture has not been as well studied. That is, there is not the same agreement as to the mechanisms by which culture changes over time. To a large extent, this is due to the fact that there may not

be a unified set of mechanisms and to the presence of chance. Moreover, the speed with which cultural practices and innovations change is much greater than the speed of genetic change, which allows for a certain stability in the latter that might be absent in the former. However, in the midst of this speed and the variety of causes that produce cultural changes, it is feasible to find a structure analogous to that which explains natural evolution, which, as in the case of biological evolution, allows us to give a central place to chance within a theory of cultural change.

In this chapter I propose to evaluate the possibility of applying to cultural evolution mechanisms analogous to those of Darwinian and Lamarckian natural selection, as does the dual inheritance theory of Robert Boyd and Peter Richerson (1985, 1990, 1995, 2011), but including, as key elements, mental simulation and language. In the case of cultural evolution, however, the mechanisms of group natural selection explain better than those of individual natural selection, although they are not mutually exclusive.

The dual inheritance theory was proposed in the 1980s by Boyd and Richerson to argue, basically, that genes and the elements that constitute culture interact with each other producing feedback loops that lead them to modify each other. Two central theses of this theory are: (i) that genetic changes can produce cultural changes, and *vice versa*, and (ii) that culture has an evolutionary process caused by mechanisms analogous, but not identical, to Darwinian and Lamarckian selection. Although in the 1980s this theory was the object of skepticism and questioning, it is now a widely accepted conception, to the point that it could unify the different social sciences, and these with biology, to achieve an integrated explanation of human behavior. But it will be necessary to begin with some definition of culture.

The word “culture” has so many meanings that using it often confuses more than it clarifies. For the purposes of this text, I will use it in the sense of the set of skills, social practices, norms, information, beliefs, values and institutions that a community transmits among its members and also transgenerationally –that is, horizontally, vertically and diagonally, according to the nomenclature coined by Cavalli-Sforza & Feldman (1981)– both consciously and unconsciously, but not genetically. The aforementioned would be the elements that make up culture, and this can be seen as a sum of innovations, some of which are highly effective for the survival of the group and, therefore, are transmitted, while those innovations that are not effective are lost. Thus, culture, understood in this way, is a highly successful instrument of adaptation to the environment, both natural and social.

Every human community has culture and, in this sense, it cannot be ruled out that some non-human species also have it, which is evident when, for example, some apes teach others to wash and peel tubers and, after a certain time, this skill is acquired by all the members of the community, who teach it to the younger ones. In the case of these rudimentary forms of culture, individuals (birds or apes, for example) mimetically and non-consciously adopt some forms of behavior of other individuals

that prove successful for the individual and adaptive for the group (see Jones & Rendell, 2018; Laland & Bennett (eds.), 2009). All of these animals have complex forms of communication, although not language with the characteristics of human language. In this domain, what differentiates us from those animals endowed with rudimentary forms of culture is the complexity and volume of information we can transmit, as well as the speed with which we do so, which is made possible by the capacity for mental simulation associated with the characteristics of human language, with its properties of recursivity, the possibility of referring to objects that are not present –what is called displacement–, and the potential to construct abstract concepts.

In the case of the genus *Homo*, the first forms of culture emerged at least about 2.6 million years ago, which is when the first tools used by *Homo habilis* date from; but the use of older tools made of material that could not be preserved, such as wood, cannot be ruled out. Much earlier, however, the australopithecines already used tools about 3.3 million years ago. *Australopithecus afarensis*, which lived between 3.9 and 3 million years ago –who is often considered our direct ancestor and the common ancestor of all forms of australopithecus– had hands that could have been used to manipulate small tools.

However, it is common to speak of culture as if it were a different dimension superimposed on the biological nature of human beings and not integrated into it. In fact, there are still those who ontologically distinguish between nature and culture, as if they were two different orders of reality to be studied by different types of sciences, natural and human. The latter, originally Hume (1998 [1739-1740], book III; 1993 [1751]) called moral sciences, in the sense of behavioral sciences, since his aim was to become the Newton of this type of science. Later, German philosophers would translate moral sciences as *Geisteswissenschaften*, as opposed to *Naturwissenschaften*.

To object to such a rigid distinction between nature and culture, especially in the field of morality, De Waal (2005, 2007) called “the veneer theory” the idea that moral behavior is like a layer superimposed on the biological, where our biological nature is selfish and brutal while culture mellows and civilizes us, turning us into cooperative creatures; but as soon as that veneer peels off, our true and real essence emerges. Of course, Hobbes (2010 [1651]) is one of the paradigmatic and oldest representatives of that conception.

My position is that culture is a product of evolution like any other, an emergent property of biology that nevertheless interacts with biology, mutually modifying each other. I propose that culture should not be seen as something superimposed on the biological, but as a set of social structures and a store of information integrated with biological processes. The cultural selection of groups filters social practices and the information that survives, from that which is lost. Precisely languages are examples of this interconnection, because, although the faculty of language is a neurological

structure, it is only activated to allow the acquisition of a language within a culture. This language and the concepts that it allows to build are transmitted among the members of the community, generating cultural adaptations that can be very successful. This is why languages are good examples of cultural selection of groups. On the one hand, their phonetic, semantic and morphosyntactic structures are molded according to the adaptive needs of the community of speakers. On the other hand, groups with languages that are more adaptive for a given environment—for example, with greater semantic diversity and precision for new needs or with a more flexible syntax if it is a *lingua franca*—will have more possibilities of communication and, therefore, of survival. An example of this is the Silbo Gomero language of the Canary Islands, which, as far as is known, made it possible to codify the extinct Guanche language by means of whistling, which allowed its whistler-speakers to communicate in an extremely rugged geography up to five kilometers away. Today, the whistlers do so with Spanish. Another example of language adaptation to the environment is the case of diglossia, where the subordinate language adopts phonetic, semantic and morphosyntactic characteristics of the prestige language.

Finally, an even more obvious example is what happens with traditional languages that have been absorbed by urban societies or that have to share territory with languages of urban communities. Imagine, for example, a community of Pirahã speakers in the Brazilian Amazon whose environment is rapidly changing from rural to urban. The speakers of that language will face several options to adapt to the new circumstances: learn the urban language, *e.g.*, Portuguese; incorporate Portuguese lexicon into Pirahã; emigrate, etc. The pressure of the new environment will force the speakers of Pirahã to adapt or die in a manner analogous to what happens when a new environment forces individuals of a species to adapt or become extinct, and the different types of natural selection will have their analogs in the cultural selection that will operate on linguistic change to make the language evolve or disappear.

In general, languages adapt to the environment, that is, to the natural and social world and, more specifically, to the presence of other languages. Languages adapt in many different ways. In the phonetic dimension, a good example is precisely the aforementioned Silbo Gomero of the Canary Islands, as it allows speakers to communicate over very long distances. In the semantic dimension, languages adapt when they acquire, coin or borrow words to refer to objects, events and properties that are important for the survival of the speakers. The same happens in the morphosyntactic dimension. Thus, for example, some languages have evolved morphosyntactic properties to mark social relations of power or kinship, for example, or even epistemic intuitions. Thus, for example, languages with evidentiality systems mark with suffixes the source of information of the speaker, her degree of certainty of what she says and her epistemic responsibility (see Quintanilla, 2023 for a discussion of the relations between epistemic and evidential intuitions in Quechua). Although every language has the capacity to make its speakers' epistemic intuitions explicit in a variety of ways, if its speakers want to do so, languages with an

evidentiality system force their speakers to use evidentials and thus to be aware of those epistemic intuitions in almost all situations. The fact that evidentiality systems remain in these languages for a long time suggests that they possess an adaptive advantage that justifies the permanence of such morphosyntactic complexity. In addition, a very important means of adaptation of languages for the survival of their speakers is language contact. Languages not only adopt more useful features of other languages, but, above all, features of more prestigious languages, as this is of great benefit to their speakers. The question of how languages adapt to the environment is, however, a topic of much controversy (see Mufwene, 2008; Mendivil-Giró, 2015; De Busser & Lapolla, 2015; Lopyan & Dale, 2016).

The first groups of hominids among which protolanguage evolved had a superlative advantage over others who did not have this means of communication and articulation of their thoughts, which generated more successful mechanisms of cooperation and competition. It cannot be ruled out that this was one of the advantages that our ancestors had over the Neanderthals. Although it is very likely that they had some form of language, it is possible that it was more rudimentary than that of our ancestors, considering that the Neanderthals probably had lower capacities for social cognition, given the characteristics of their skulls.

However, the processes by which the biological and the cultural interact are extremely complex and we can barely glimpse their characteristics. What seems clear, however, is that the evolution of our species generated what we call “culture” and that, for this to be possible, some physical characteristics were needed, such as bipedality –to leave our hands free–, certain cognitive capacities and social cognition skills –such as psychological attribution, theory of mind, mental simulation capacity, non-linguistic forms of communication and later language–. Culture enhanced these cognitive abilities and even produced structural modifications in the brain for better storage of social information; these brain modifications, in turn, enhanced cultural production, generating a spiral that still continues and that has made us the species we are.

Consider two examples of how the cultural and the genetic interact with each other. The first has to do with the discovery that cooked food –especially meat– was easier to chew, swallow and digest, and less likely to be harmful. The massification of cooked food resulted in many genetic changes in chewing and in the gastrointestinal system. In turn, these genetic changes led to the search for new, more beneficial food inputs. This, in turn, led to cultural innovations of a gastronomic nature. A second example is the invention of writing. The massification of learning to read leads to structural transformations in the area of the brain that controls this ability, which, in turn, produces new cognitive abilities that are expressed in new cultural products. Of course, there is an even more radical example of interaction between culture and genes, and it is precisely genetic manipulation that may result in

new skills that could produce cultural innovations that, in turn, will significantly influence genetic manipulation.

Let us now ask ourselves how culture evolved and whether there are group selection mechanisms that foster or make possible the selection of cultural innovations, be they tools, social practices, beliefs, values or institutions. As we have seen, central to answering both questions is the concept of dual inheritance, also known as biocultural evolution or gene-culture coevolution. The idea is that human communities are the result of two integrated processes: on the one hand, genetic evolution, marked by natural selection in its various forms recognized by Darwin or proposed after him. On the other hand, cultural development, by which cultural elements are transmitted cumulatively, horizontally and transgenerationally. Genetic and cultural changes interact causally, feeding back on each other. The processes of genetic and cultural evolution are not identical, but they are similar, and can be taken into account to explain, and eventually predict, the generation of certain cultural processes in specific communities. The components that make up culture are selected by Darwinian, but also Lamarckian, adaptive mechanisms, insofar as acquired traits are also transmitted (see Henrich & McElreath, 2003).

Boyd and Richerson consider that the cultural components subject to adaptive selection are mainly norms, but I would include skills, social practices, information, beliefs, values and institutions. It is possible that they are implicit in Boyd and Richerson's model, but I think it is important to make them explicit. These elements are learned mimetically by the various members of the community, preserving the most adaptive and eliminating those that are not. In general, people tend to copy the behavior and beliefs of people considered successful in their community, without necessarily having the ability to discriminate which elements make them successful and which are neutral. Thus, those traits that do have causal efficiency in their success will tend to be maintained and those that do not will be lost. It may happen that individuals copy counter-adaptive beliefs and forms of behavior that accompany the adaptive ones, as long as they are not strong enough to make the whole package counter-adaptive. But it is not only those components that are adaptive, but also the ability to incorporate them quickly into behavior.

Moreover, groups that develop the ability to transmit these traits to each other quickly and permanently are better adapted than those that do not have these abilities, which causes the latter to integrate with the former by acquiring their characteristics or to disintegrate as a consequence of migration. This makes cumulative cultural development evolutionarily advantageous.

Although the thesis that the elements that make up culture develop through mechanisms analogous to those of natural selection was proposed by Darwin himself, in *The Descent of Man, and Selection in Relation to Sex* (1994 [1871]), the theories of social Darwinism developed at the end of the 19th century, mainly by Spencer (2021), its theoretical limitations based on the thesis that evolution is unidirectional

and teleological and, in particular, its disastrous political consequences during the 20th century, discredited any idea that implied the evolution of groups and cultures through mechanisms of adaptation and survival. For this reason, it was only much later, with the work of Campbell (1965, 1975) and Cavalli-Sforza & Feldman (1971, 1981, 1986) that this research was resumed, now free of the theoretical and empirical errors of social Darwinism, and without its disastrous political consequences. The book that laid the foundations for a mathematical model of cultural evolution is the aforementioned book by Boyd & Richerson (1985).

Today it is generally accepted what Campbell had argued in 1965, that natural selection is a sufficiently general mechanism to shape any system of inheritance. It is also accepted that natural selection acts at different levels of biological organization, and that it has analogues in cultural organization, according to four types of selection: directional, stabilizing, disruptive and sexual. In the first case, a phenotype is selected (for example, light skin color in northern areas) towards something more favorable according to the environment. In the second case, intermediate phenotypes are more successful than extreme phenotypes (e.g., a tan skin color in the Mediterranean). In the third case, extreme phenotypes are more successful than intermediate ones (as in the case of the finch beaks that Darwin studied in the Galapagos Islands). In the fourth case, a phenotype is selected that is attractive for mating, such as, for example, the mane of male lions that indicates good health.

On the other hand, concerning the mechanisms of selection, it is generally assumed, especially among the proponents of the theory of dual inheritance, that, also analogous to natural selection, there are five: natural selection of cultural elements: random variation, cultural drift, guided variation and transmission bias.

Natural selection predicts that the most adaptive population cultural characteristics will allow the survival of the carrier groups, so that they will tend to spread. Analogous to genetic mutations, random variation is the product of successful information transmission errors. Similarly, and similar to genetic drift in which random changes in allele frequencies in a population change over the course of several generations, cultural drift is the process by which chance causes population cultural traits to be maintained or disappear, which occurs mostly in small populations. The concept of guided variation alludes to the fact that, as a consequence of various factors, a cultural element learned or developed by an individual can be transmitted to the whole population because of its adaptive potential. Finally, biased transmission refers to the fact that some cultural elements benefit more than others in the transmission process. The discussion on this topic has been expanding the number of recognized biases (see Henric & McElreath, 2003). For example, success, ability, prestige or similarity biases are part of the category of model biases, in which certain imitation paradigms transmit cultural traits. The point is that there are group selection processes marked not only by genetic selection but also by cultural trait selection.

One of the adaptive advantages of cultural innovations is that they make collective cognition possible. That is, the existence of a store of information that is maintained beyond individual memories, whether in a shared system of beliefs and values expressed in a shared system of social practices, in language itself, in utensils created to store information –such as written language– or in social practices that are stable over time. Much of this information is social, that is, it is not only about the natural environment but also about the social world, since, for example, it includes mechanisms for predicting the behavior of others, conflict resolution, cooperation, competition and manipulation, among others. Thus, problems that could not be solved individually are solved collectively, often without the awareness of individuals. There is much evidence to suggest that most innovations, and the most original ones, are the product of the intervention of many individuals, whether working on the same subject or not, and that the more cultural mixing there is, the more creativity there will be (see Henrich, 2023). Collective cognition, whether conscious or not, makes collective agency possible, which is fundamental to the needs of cooperation with the ingroup and competition with exogroups.

But I wish to insist that, although culture is a product of evolution, cultural evolution should not be seen as a case of biological evolution but in analogy with it, considering, however, that both processes are integrated. In biological evolution, heritable variation and selective retention, as well as a successful mutation, are selected and, over time, can be transmitted vertically within a species, modifying it. In cultural evolution, a successful conceptual innovation can diffuse vertically, horizontally and diagonally within a group, significantly transforming it. Dawkins (1976) coined the term “meme”, by analogy with gene, to refer to the unit of information that has the capacity to self-reproduce (see Holdcroft & Lewis, 2000). Other authors have suggested the terms “mnemes”, “semes”, “cultural traits”, and “ideas” (see Cavalli-Sforza, 1971; Cavalli-Sforza & Feldman, 1981). I am inclined, however, to use the term “concepts”, understood as systems of beliefs and values, usually highly condensed, which may or may not be lexicalized, shared by a human group. These beliefs and values are both representations of the world (as it is or as we would like it to be, respectively) and dispositions to act in it, so that they form highly densified structures of shared social practices.

Concepts are instantiated in the brains of their users as neural configurations, but they are also social structures that exist in the relationships between individuals and therefore have a reality beyond the individuals themselves, although not outside the community. Innovative concepts are transmitted while retaining their contents in almost identical form or with variations, which may be more or less pronounced. Sometimes concepts emerge that give the impression of being completely new, although in reality they are always rearrangements of features that were previously found in several different, but unrelated, concepts. Conceptual innovation, therefore, is the ability to establish connections or relationships that had not been seen or proposed before (see Boden, 1990, 1994a, 1994b, 1998; Quintanilla, 2019, ch. 6).

The selection of innovative concepts operates at all cultural levels, just as natural selection operates at all biological levels. In this way, an innovative concept spreads in a community and is transmitted transgenerationally, modifying both its worldview and its behavioral practices which, for all practical purposes, are almost impossible to separate. The point is that the mechanisms that select innovative concepts are analogous to those that select mutations and phenotypes.

The transmission of cultural conceptual innovations is based on imitative models that require the capacity for mental simulation. We observe what people do and, from that, we build a small model of beliefs and desires that causally explain and justify their actions. We attribute mental states to other people in order to understand their actions and, on the basis of the new behavior we observe, we make modifications creating a reflective equilibrium in which the different attributions are consistent with each other and with the actions recognized in the behavior of the observed agents. This allows us to differentiate between what we believe they believe, what we believe they want, and what we believe they do, at various levels of intentional meta-representation, modifying each attribution as long as they do not correspond to the new evidence. In this way, we explain, understand, anticipate, predict, and imitate the behavior of others.

The mechanisms of mental simulation are essential pieces for a theory of mind, which in turn is necessary for cumulative cultural evolution. Simulation is necessary for the development of social cognition in two senses: on the one hand, it enables the processing of social information and collective cognition; on the other hand, it facilitates the storage of that social information, whether in the brain itself, in supports external to the body itself, or in the social practices that constitute social behavior itself. This, in turn, is necessary for cultural evolution.

The ability to simulate is a cognitive and affective achievement of infants, which allows them to imagine counterfactual scenarios as representations of states of affairs that are not real but possible, and their own and others' mental states that could have occurred under different conditions or that could occur if certain conditions were met. Simulations, therefore, are mental models of objective reality (whether natural or social), intersubjective reality (what happens or could happen in the minds of others) and subjective reality (what happens or could happen in one's own mind). In simulating we imagine what the world might have been like if circumstances had been different, what it might be like if we made certain decisions and not others, and what our mental states and those of others would be like if some circumstances were present instead of others. These simulations may or may not be conscious. In fact, most of them are not, but they are present when we make quick, automatic decisions. When interacting with other people, we simulate being them under counterfactual conditions, which allows us to imagine what they experience or would experience, given different possible scenarios.

Social cognition has simulation as a basic pillar, something that is particularly applicable in situations of cooperation and competition. Imitation of the behavior of others, which is fundamental for the transmission of social information, which in turn is basic to cultural evolution, begins as a non-conscious process, as seen in motor imitation (*motor mimicry*) and in the emotional contagion of infants. However, after a certain age, between five and seven, much, though not all, of this imitation can become conscious, so that the child imitates the behavior of others because she¹ is able to imagine what they believe, desire and feel, as well as what they would believe, desire and feel if one scenario were given instead of another. Moreover, she becomes capable of imagining what she herself would believe, desire, or feel if a scenario were to obtain, if the other were to act in a certain way, and if she were to react in one way or another to his behavior or in relation to her own behavior. All this in several levels of intentionality that, in the case of adults, reaches up to four or five without major inconveniences.

The notion of mental simulation is used in much recent literature on the nature of psychological understanding and attribution (see Quintanilla, 2019). The first to make it explicit was Craik (1943) who used the expression “mental model” to argue that the mind constructs small-scale models of the world to make successful predictions. In this way, we imaginatively rehearse actions that could later be real, reducing the risk of error. Simulation is a type of anticipatory experience, which is highly adaptive (see Kappes & Morewedge, 2016). Likewise, simulation underlies belief systems, which are systems of representations of reality and dispositions to act on it. The idea is that human forms of culture require some degree of simulation capability, for simulation is necessary for basic activities such as making tools, which one imagines might be useful in certain contexts. But it is also necessary for conveying information that one believes the other needs and for complying with Grice’s (1991) pragmatic maxims, but also for lying, deceiving, or manipulating. In general, it is necessary for making a stone knife, planning a trip, building a house and founding a civilization.

By simulating we transcend our current reality to imagine alternative possible worlds, past, present and future, as well as the mental states that we and others would have had under those conditions. It is currently believed that only human beings have this capacity and, as I argue, it makes possible social cognition, which was a necessary condition for culture to evolve. People with autism or damage to the prefrontal cortex have a significant deficit in their ability to simulate, which makes it difficult for them to imagine alternative scenarios, and to understand counterfactual or metaphorical sentences.

Now, every human society shares a very large mass of information –whether propositional or tacit, conscious or non-conscious– that no individual could have

¹ I will use the feminine gender to refer to the interpreter and the masculine gender to refer to the agent.

acquired on his or her own and that, in most cases, individuals would not be able to explain: its origin, how it works and how it can be applied to concrete cases. Much of this more basic information is the product of mental simulation skills. These, and social cognition in general, would be the result of the need of our primate ancestors to adapt to complex social groups (see Dunbar, 2003) and cultural evolution would be the result of that process.

As we have seen, this mass of information is contained in particular brains, but also in shared repositories—such as rock inscriptions, libraries and computers—and in stabilized social behavior, which far transcend individual possibilities. Such volumes of information have a great adaptive function for communities, because they function as if they were a population gene pool that is maintained transgenerationally, if it is beneficial for the survival of groups, and vanishes if it is not.

But is all the information contained in this shared heritage adaptive or is there counter-adaptive information? And if so, why did it get there and why is it maintained? It seems clear that there is a lot of counter-adaptive information, because when we talk about cultural elements we are referring to social structures and practices, as well as shared belief systems, which are integrated and difficult to separate. Examples of counter-adaptive beliefs and practices are superstitions, religious fanaticism or cures based on magical beliefs. But then again, why do counter-adaptive cultural structures exist? There are several possible answers to these questions. Many counter-adaptive beliefs and practices arise as deviations or radicalizations of adaptive beliefs and practices or, in any case, of needs and quests that have failed to generate adaptive behavior. In other cases they do have a less obvious adaptive function, such as, for example, the creation of identity mechanisms that cohere groups against rival groups. Another possible explanation is that these practices are applications to the modern world of forms of social behavior that were adaptive hundreds of thousands of years ago and that have remained as a remnant in our cognitive structure. One example is the tendency of human beings, particularly as children, to eat as much candy and fat as possible, because until relatively recently one did not know when one would have the opportunity to do so again. But today that is somewhat counter-adaptive. It seems, in any case, that, on balance, what is contained in culture is more adaptive than counter-adaptive.

Although culture does not need human language, it does require forms of communication. Language is not necessary for communication, but it is necessary for the rapid transmission of massive, complex, varied and structured information at various levels of intentionality. Language, therefore, has promoted the cultural evolution of groups, and languages are good examples of social processes subjected to this type of evolution, since they integrate the biological and the cultural.

But the concept of language requires precision. In a specific technical sense, it is an innate capacity in human beings that is socially activated, a product of the evolution of the brain and modularly composed. Among others, its main features are

recursion, the ability to refer to absent objects –displacement– and the property called merge. As we have seen, it is not necessary for there to be language in this sense for the appearance of culture, although forms of communication of some other type do exist, but the existence of language in the defined sense makes cultural transmission much more efficient.

Language represented a cognitive revolution in our ancestors, because it facilitated communication and abstract thinking, which enhanced cooperation with the ingroup and competition with the outgroup. It most likely emerged progressively (Burling, 2005; Fitch, 2010), although there is debate regarding the selective pressures that enabled its emergence. Pinker & Bloom (1995) suggest a gradual evolution by natural selection, while Jackendorf (1999) proposes a layering of levels from simple grammatical rules that became more complex. Bickerton (1994 [1990], 1998, 2000, 2009) proposes two moments: in the first, a proto-language, which would be a semantic structure without syntax, and later, a cognitive revolution that would generate language in the current sense.

There is some agreement that first there would have been some kind of non-verbal and non-conventional communication, such as that present in other social species that communicate mechanically with body movements or positions. Secondly, what Scott-Phillips (2014, 2015) calls “ostensive-inferential communication” would emerge, which is the ability to use the body to indicate something, so that another individual can infer the communicator’s intention, such as a head movement to indicate the presence of water to someone we know is thirsty. Later, conventional kinds of nonverbal communication would appear, such as body movements or grimaces that take on conventional meanings within a community. Later on, conventional forms of verbal communication would emerge, which would later give rise to semantics and, later, to syntax. The success in communication and abstract thinking that these different levels of language generated in groups is one of the most remarkable cases of group selection, both in the genetic and cultural sense, and is the best evidence of dual inheritance, in which biological and cultural contents interact causally and mutually enhance each other.

It is now necessary to address, albeit briefly, the problem of group selection. In the fourth and fifth chapters of *The Descent of Man*, Darwin (1994 [1871]) argues that the more cooperative groups have a greater chance of survival than those that are less cooperative, so that natural selection would select the altruistic traits that, in this way, would be transmitted hereditarily. This thesis, which has had a great deal of influence, but also detractors, maintains that the more cooperative groups were selected because they had a greater chance of survival. This, in turn, would have selected the most cooperative individuals, generating a tension between cooperative and competitive tendencies, with cooperation taking shape mainly within the closest groups, whether blood relatives or collaborators in defense and food acquisition. Darwin proposed, therefore, that natural selection operates at the level of traits,

organisms and groups of individuals, although the latter was highly questioned, because it was not clear how the most cooperative individuals could survive against the selfish ones, before the cooperative group was formed, which gave rise to what was called the paradox of altruism (see Quintanilla, 2009b).

To deal with this drawback, Hamilton (1964) postulated the theory of kin selection and Trivers (1971) that of reciprocal altruism. Eventually there was a revival of group selection theory with Wilson (1998) and Sober & Wilson (1998). See also (Axelrod, 1981; Axelrod & Hamilton, 1984). Other authors, such as Richerson *et al.* (2016), have suggested that cooperative group selection resulted in the selection of norms beneficial to group survival, that is, adaptive moral values. That would be an important example of a permanent and cumulative structure of cultural evolution. This thesis could lead to defend a form of moral realism, based on moral facts resulting from the selection of adaptive groups on the basis of their group cohesive values (see Quintanilla, 2009a, 2009b).

Genetic group selection has been questioned because, according to some evolutionary theorists, genetic variation between groups is not large enough to maintain differences over time, especially when considering the effects of migration. In contrast, in the case of group cultural selection, there is competition between groups that have social structures that are maintained over a sufficiently long time for intergroup differences to be significant. According to Mathew *et al.* (2013), the existence of stable norms over time favors small-scale cooperation, which reinforces the cultural evolution of groups. Following this position, human cooperation is fostered and structured by norms that have evolved culturally and make cultural evolution possible; these norms are under the scrutiny of the community that sanctions those who do not follow them and even sanction those who have the obligation to sanction those who do not follow them, but do not do so.

The problem with this position, however, as Seabright (2010, pp. 168-9) has pointed out, is that there is often disagreement within the group as to who is breaking the norm and who is not. But the fact that such disagreement is frequent does not mean that, in general, there is more agreement than disagreement. The existence of many clear cases of non-compliance with norms sanctioned by the community is sufficient for these norms to be maintained over time, as long as they are adaptive.

However, given that, broadly speaking, different groups would have similar social integration needs for the community to succeed in sustaining itself over time, it is very likely that there would be a set of universal norms. Some candidates have to do with the protection or elimination of human life, limits on the use of power and the restriction of freedom, the practice of sex, the distribution, consumption and preparation of food; although, naturally, the specific characteristics of these norms vary according to the adaptive needs of each community. The criteria for sanctioning those who break the rules also vary from group to group, as do the sanctions that apply to those who fail to sanction appropriately –whether by default or excess–those

who break the rules. In any case, it does not seem to me that the problem lies in what Seabright points out, but in the fact that, in many cases, the rules are at the service of minorities that have the power to establish, interpret and apply them according to their own benefits.

A central point in the cultural selection of groups is that individual intelligence, social cognition and agency are extremely insufficient to solve the problems that hominid groups had to face since about three million years ago, when the herd with which they had to interact began to grow significantly, also generating an increase in social conflicts. This fact led to the generation of forms of intelligence, social cognition and collective agency, which made it possible to solve problems impossible to be solved by isolated individuals, thus allowing for cumulative cultural adaptation.

The idea, then, is that for the survival of the group –which is a necessary condition for the survival of the individual– collective agency and intelligence are much more important than individual agency and intelligence. In turn, to explain these collective phenomena it is necessary to include mental simulation as a central piece. Communication is also necessary, although not language, but language makes possible the rapid transmission of massive and complex information at various levels of intentionality. In this way, the theory of dual inheritance seems apt to explain cultural evolution. However, given the importance of mental simulation and language in this phenomenon, it is necessary to complement it with integrated conceptions of these capacities.

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Disentangling human nature: Anthropological reflections on evolution, zoonoses and ethnographic investigations

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Abstract

Human nature is a puzzling matter that must be analysed through a holistic lens. In this essay, I foray into anthropology's biosocial dimensions to underscore that human relations span from microorganisms to global systems. I argue that the future of social-cultural anthropology depends on the integration of evolutionary theory for its advancement. Ultimately, since the likelihood of novel zoonoses' emergence, digital ethnography could offer remarkable opportunities for ethical and responsible inquiries.

Keywords: Anthropology, ethnography, zoonoses, evolution, human nature, multispecies entanglements

INTRODUCTION

It is a vexing question to ask what the purpose of human beings on Earth is. After all, if we rule out teleological and metaphysical explanations, we only remain

with biological ones. For example, since the advent of Darwinian evolutionary theory, modern science's advancements can now give us accurate molecular data to infer phylogenetic relationships (Oyston et al., 2022). We can also predict the evolutionary history of extant metazoans by analysing the Edicara Biota from 570–539 Mya (Evans et al., 2021). Besides this, we have good empirical evidence to estimate the African origin of our hominin clade, about 10–6 Mya (Steiper & Seiffert, 2012; Besenbacher et al., 2019; Püschel et al., 2021; Daver et al., 2022). Despite the limitation of the fossil record, we can provide the approximate emergence of *H. sapiens* in the African continent 315 ± 34 thousand years ago (kya) (Hublin et al., 2017; Richter et al., 2017; Cabrera, 2020 but see Bermúdez de Castro & Martinon-Torres, 2022).

Thus, the more we delve into our evolutionary history, the more complicated it becomes to comprehend its subtleties, like our earliest dispersal into Eurasia, roughly 70–200 ka as hypothetically suggested by recent findings (Petraglia et al., 2010; Groucutt et al., 2015; Rabett, 2018; Harvati et al., 2019; Vallini et al., 2024). Since then, we have filled diverse ecological niches, interbreeding with other hominins like *H. neanderthalensis* and Denisovans (Sankararaman et al., 2016; Stringer & Crété, 2022) and, therefore, becoming "the world's greatest evolutionary force" (Palumbi, 2001) which conquered almost every geographic region of the Earth. As a result, anthropogenic alterations to biodiversity are arguably the primary source of species extinctions and extirpations ranging from the Late Pleistocene of global human expansion to early urbanised societies and commercial networks (Boivin et al., 2016).

Based on the anthropogenic modification of Earth's strata, a new geological epoch called the Anthropocene supersedes the Holocene (see, e.g., Zalasiewicz et al., 2011; Waters & Turner, 2022); this, in turn, likely materialised during the "Great Acceleration" of the mid-20th century since the intensification of economic growth coupled with technological development were primary factors of the disruption of ecosystems on a planetary scale (Steffen et al., 2015). From this, it follows that our presence in the material world is inextricably intertwined with other existents, paving the way for inexorable chaotic possibilities. Consistent with this statement, zoonotic and vector-borne diseases likely diffuse via human-induced alterations of ecosystems and climate change (Páez et al., 2018; Del Lesto et al., 2022). That said, as with *Yersinia pestis* bacteria, which devastated Eurasian populations during the Neolithic (Andrades Valtueña et al., 2022), the new SARS-CoV-2 (Rajendran & Babbitt, 2022) reminds us that cross-species transmission depends significantly on the different modalities of human existence. Zoonoses, therefore, are the by-product of the entangled and intricate relationships among humans, different animal taxa, and their niches (e.g., MacGregor & Waldman, 2017; Doron, 2021; Milstein et al., 2022; Shaffer et al., 2022; van Vliet et al., 2022; Arregui, 2023).

No wonder, then, the predicament of our human condition involves a wide array of socio-ecological, political, and economic factors affecting a globalised world and

its endangered life forms. How does socio-cultural anthropology scrutinise and tackle those insidious issues? Why ethnography's holistic and in-depth perspective is fundamental to drawing inferences concerning our contemporary life? Given our current global situation fraught with wars, pandemics, environmental degradation and socioeconomic inequalities, the inveterate practice of anthropological inquiry has an advantageous position to grasp conspicuous empirical realities. In short, the question of what it is to be human in connection with other entities is increasingly crucial as life becomes more complex due to the acceleration of neoliberalism and technoscientific innovations.

IN THE SEARCH FOR LIFE'S COMPLEXITY

As we navigate across anthropological reflections about our biological and socio-ecological conditions, living amid future uncertainties strengthens the will for a better understanding of human nature. Socio-cultural anthropology, in particular, allows us to holistically observe the interconnectedness between subjects and their socio-material actualities. Crucially, the uniqueness of our discipline has been demonstrated since the dawn of long-term ethnographic immersion. Those theoretical and methodological contributions emphasise that either the Trobrianders (Malinowski, 1922), the Nuer (Evans-Pritchard, 1940) or the Tsembaga (Rappaport, 2000 [1968]) are nothing without the fabric of social relations established among humans and between, say, humans and shells, cattle or pigs. Those phenomena are illuminating considering the latest anthropological and philosophical interests in multispecies entanglements (e.g., Kohn, 2007; Candea, 2010; Kirksey & Helmreich, 2010; Van Dooren, 2019; Kirksey, 2020; Daly, 2021; Hartigan, 2021; Arregui, 2023), not to mention the relational onto-epistemological underpinnings that arise from the analysis of ethnographic data (Viveiros de Castro, 1998; Bird-David, 1999; Ingold, 2006; Descola, 2013; Rose, 2013). So, why do relationships matter significantly in anthropological thinking?

It is hardly surprising that, as far as social anthropology is concerned, the tools of natural sciences determined how individual organisms' social relations were analysed empirically by the former (Radcliffe-Brown, 1952). Of course, those were principally human institutions' structural and functional properties. These societal systems are, however, enmeshments of sympatric species ranging from mammals to insects and plants, as in the case of totemism. It is thus palpable that, as anthropologists, we follow the "eternal pursuit of complexities" in that sociality transcends the anthropocentric order of things (Abad Espinoza, 2022c). This move towards holistic thinking has profound implications regarding the construction of anthropological knowledge. If a superorganic conception of human culture (Kroeber, 1917) elevates our rational soul from the rest of corporeal nature, then an ecocentric perspective (Ojalehto Mays et al., 2020) reverts our ontological status to our

evolutionary roots as hominins. Notably, there are striking parallels between indigenous animistic ontologies and scientific studies ranging from animal culture and cognition (Griffin, 1998; Allen, 2019; Schuppli & Van Schaik, 2019) to plant intelligence (Marder, 2013; Mancuso & Viola, 2015; Calvo et al., 2020). Through these lines of evidence, we can better understand the interwoven structures of life, thus absorbing human nature into the primordial order of things. Consequently, one might ask: what can social-cultural anthropology contribute to analysing these complexities and entwinements?

THINKING ANTHROPOLOGICALLY: FROM ZOOSES TO DIGITAL INQUIRIES

One of the most pivotal topics during ethnographic fieldwork is the attentiveness to social life, both locally and globally conceived. That is, anthropological thinking gives us the essential means to grasp the micro-macro contemporary societal issues. For example, during my first fieldwork among the Shuar of the Ecuadorian Amazon, I observed the unrestrainable effects of neocolonialism and global capitalism on indigenous peoples and their ecologies. Notwithstanding the positive association between the extinction of indigenous languages and the loss of ethnobotanical knowledge (Cámara-Leret & Bascompte, 2021), the Shuar struggle to preserve some of their relationships with plant life. The vegetal world, therefore, still plays a crucial role in shaping their way of being, oscillating from their metaphysics to aesthetics and well-being (Abad Espinoza, 2019, 2022a).

The COVID-19 pandemic outburst, however, transformed the socio-material ethnographic immersion into imaginative anthropological voyages in the midst of isolation. Specifically, the inevitable cancellation of my second fieldwork had significant implications for ethnography's ethical, methodological and theoretical factors. On the one hand, it became clear that zoonotic spillover moves swiftly across geographic boundaries, underscoring our biological vulnerabilities; on the other, ethnography's plasticity allowed me to transform into virtual investigations the otherwise archetypal bodily engagement of participant observation. Though this radical shift changed the intimate multisensory experience of fieldwork's socio-ecological settings, digital ethnography operated as an impervious barrier to pathogenic transmission, providing ethical and reflective methods to dive into indigenous' biocultural worlds immaterially. To put it bluntly, the myriad of natives' images, sounds, and voices circulated within the different spatio-temporal realities of the digital world functioned as stimulators of previous fieldwork's embodied experiences (Abad Espinoza, 2022b). Could one achieve such an understanding without careful anthropological reflection? The plain answer is no.

As stated previously, the practice of anthropology involves holistic thinking that bridges the gap between the biological and social domains. We cannot aim to understand our current climate crises, the emergence of zoonotic diseases, mass

extinction, or rising socioeconomic inequality without paying close attention to our evolutionary history's ecological and socio-cultural determinants. For example, the Holocene saw the emergence of sedentary patterns through the intensification of plant and animal domesticates, triggering the loss of dietary breadth and the transmissibility of zoonotic pathogens (Larsen, 2023; Lewis et al., 2023). If social-cultural anthropology aims to clarify the current Anthropocene epoch, it must integrate these biosocial facts of human evolution. We can thus shed light on the variations of behavioural patterns and coevolutionary spatio-temporal dynamics of the human-environment interface. Considering these evolutionary trajectories, we can better appreciate how indigenous peoples coped and thrived during Holocene climate change events, demonstrating adaptive and flexible socio-eco-cosmological systems (Robbins Schug et al., 2023).

In the Amazon, for instance, recent archaeological findings suggest that complex settlements existed before the European invasion (Prümers et al., 2022), albeit domestication is foreign to natives' relations with nature characterised by "familiarisation", as in the case of human-plant interactions (Fausto & Neves, 2018). Accordingly, the virtual investigation with the Shuar corroborates these inferences since this society's ethnopharmacological knowledge not only provides means to combat COVID-19 but also reveals the intricate relationships between humans and the vegetal world (Abad Espinoza, 2022b).

KEEPING PACE WITH BIOSOCIAL CONTINGENCIES

How will the future of anthropological thinking and ethnographic analysis be in the following decades? Viewed through the lens of this chapter, it emerges that to decenter the privileged ontological condition of human nature, anthropology must embrace a biosocial perspective concerning our primordial origins on Earth and the variations of our evolutionary paths within different eoniches. This is a challenging commitment for socio-cultural anthropologists who primarily look at human cultural diversity, paying little attention to ecological and biological determinants. If we aim to move beyond human categories of perception (Kohn, 2013), then a compenetration of diverse scientific pursuits might elucidate how life forms relate and coevolve, forming complex multispecies assemblages. Should we heed Amerindian myths of dinosaurs' big bones, like Lévi-Strauss's peculiar advice to Anne-Christine Taylor and Philippe Descola (Bacchiddu & González Gálvez, 2017) to comprehend human-environment temporal dynamics? Alternatively, could those mysterious and never-heard myths address the interaction between humans and the Late Pleistocene megafauna? Indeed, the future of our discipline's advancements depends on a solid interdisciplinary collaboration to tackle those complicated issues in the face of biocultural destruction.

Furthermore, given the likelihood of future pathogenic infections owing to our unsustainable relationship with nature (Lorenz et al., 2021; Weaver et al., 2022), technological innovations might provide the means to connect disparate geographic and socio-ecological realities, avoiding potential contagions. After all, smartphones circulate even in Amazonian villages, though there is still low internet access. Nevertheless, this has important implications for the future of digital ethnographic research among vulnerable communities since dematerialised forms of sociality provide ethical parameters that safeguard both interlocutors' and anthropologists' lives. By using the positive side of technology, we can enrich our methodological tools and combine, if possible, in-person and digital ethnographic methods to clarify our puzzling contemporary world. In sum, our relationships with microbes and a globalised planet indicate that we are part of a chain in which microecologies and planetary ones intersect.

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Re-negotiating Animality for a Better Human-Animal Relationship

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Abstract

More than any other event in recent history, the Covid-19 pandemic has not only forced us to redefine the way we look at nature and other non-human animals but, more importantly, it has again provoked at the age-old debate concerning humans' (and of the society as well) troubling relationship with animals. While the spread of the zoonotic virus had initially created a scaring situation, and at times a form of revulsion toward animals for its propensity of spilling over from animals to humans, the loneliness created by social distancing and the consequent social meltdown during the containment has apparently strengthened the human-animal bonding.

Keywords: Re-negotiation, animal relations, animality, nature, social world.

INTRODUCTION

A cogent critique of the post-pandemic human-animal relationship necessitates not only an awareness of the historical contradiction of the human/animal binary, but also an assessment of the way forward toward ameliorating such a situation by

rethinking, rebuilding, and recasting human-animal relationships. Interestingly, long before animal studies had flourished as a distinct discipline, thinkers associated with the Frankfurt School have explored and problematized the troubling relationship humans have with animals. This essay would try to delve into the human-animal relationship in line with the arguments proposed by the thinkers of the Frankfurt School, particularly by Horkheimer and Adorno. Doing so would necessitate an understanding of the history of shared exploitative linkages experienced by animals and marginalized humans by adopting a critical and normative sociological and philosophical perspectives to animal studies by locating animals as the central subject of interrogation.

In post-pandemic times many countries have experienced an increase in geopolitical tensions most of which have its roots, directly or indirectly, to crises and extraction of natural resources. It is a truism that when human conflict exacerbates, issues related to animal suffering and welfare become comparatively insignificant. Common people, especially, those associated with and dedicated to animal welfare have experienced a clear symbolic non-priority in attention on the part of many governments and other institutions toward issues of animals and other non-humans. In times of elevated political stress, civil and social commotions, when human survival and security are challenged, focus on animal rights as well as their suffering are minimized till it reaches almost the point of invisibility in terms of discourse. Building on such an understanding, our propositions in this essay are, 1) Animal welfare in post-pandemic societies “became” a sort of minority discourse because of the socio-political tensions that privileged human priorities over animals’ rights 2) Animals’ torture and mistreatment has never been important to humans’ in general like other human issues, especially when violence against humans became predominant in societies 3) To understand the roots of animal suffering is to comprehend the mechanisms of power and how they contribute at the same time to animal oppression as well as human oppression, particularly, that on the women, children, racial and ethnic minorities. Therefore, it is essential to understand the need to address and discuss methodologically together as a polemic.

DECODING HUMAN/ANIMAL BINARY

One of the primary concepts in the West related to the difference between humans and non-humans is the exercise of the so-called instrumental reason as a key ideological element that distinguishes humans from non-humans. Exercise of such instrumental reason determined the ideological difference between humans and non-humans as well as their difference in terms of value and exploitation of humans and non-humans as well, emphasizing human’s superiority.

Aristotelian human animal in contradiction to irrational animals has been the foundational ideas governing Western thoughts. Commenting on how the rationality

of humans has been championed by comparing him/her against the irrationality of animals Horkheimer and Adorno argues,

The idea of man in European history is expressed in the way in which he is distinguished from the animal. Animal irrationality is adduced as proof of human dignity. This contrast has been reiterated with such persistence and unanimity by all the predecessors of bourgeoisie thought-by the ancient Jews, Stoics, Fathers of the Church, and then throughout the Middle Ages down to modern times- that few ideas have taken such a hold on Western Anthropology. The antithesis is still accepted today (Horkheimer and Adorno, 1969).

The importance of such observation lies in its emphasis over some basic premises related to the Christian-Jewish cultural traditions later reconfigured by Descartes. One of the most important arguments posed by the critics was the use of instrumental reason and its association to the problem of violence against animals. As an ideology underlined by anthropocentrism, instrumental reason is explained in terms of human domination, not only against animal, but also beyond species line, something that is also extended to the domination of other humans, particularly women, racial and ethnic classes. In other words,

The proliferation of instrumental reason, development and spread of capitalism, and unreflective technical progress not only makes the domination of nature more efficient but also leads to the domination of human beings. Humanity's attempts to master and control nature-a goal originally intended to free humanity from nature's supremacy-have paradoxically enslaved humans along with the rest of nature (Gunderson, 2009).

Horkheimer and Adorno's observation uncovers the clear linkages between relentless animal exploitation with the exploitation of humans, about how science mostly associated with maximizing profits has literally served as a tool behind such exploitative systems. Particularly related to the criticism of German Idealism and the political consequences of its application by the rise of Nazism, the critics of Frankfurt School equalized the normalization of animal torture and enslavement with human's dehumanization and brutalization undergone by Jews during the second world war. Horkheimer and Adorno's critique of animal dissection in laboratories to create new scientific knowledge corpus and the linkages of the exploitative structure with human exploitation may symbolically be compared to clinical trials of scientific experiments on people, mostly the have-nots.

Horkheimer and Adorno explore how "mass industry as well mass culture... have already learned how to apply scientific methods and manipulate bodies-both pedigree animals and of humans" (Horkheimer and Adorno 1969, p. 251). Artificial insemination, breeding, genetic mutation and mutilation, to prepare animals for the meat industry appear more attractive and profitable, as well as to ensure an endless supply to the resource base for mass consumption not only seems to justify such an observation but also an enactment of what Plato called the metaphysics of presence.

O equal terms, the Indian *mahut* working with his elephant to hoard timber in the timber industry or the poor horse-cart driver is an example of how animals and marginalized human are inextricably tied up to a common exploitative structure, something that reminds of what Horkheimer in a letter claimed that, “the fight for the animal...is a fight for man” (Jackobson 2007, pp. 227-28).

Ironically, neither Adorno nor Horkheimer survived to witness the sophistication in all the forms of representation related to mass industry as well as mass culture and their relationship to humans as well as animal exploitation and extermination. These spectacles of horror are displayed in the horrible animals’ factories and slaughterhouses. Studied through the lens of social-ecology, such an exploitative rationale has often been used against humans ever since colonial times primarily to demean the natives/indigenous people and thereby occupy the lands.

Though, with the end of the Second World War colonialism has formally come to an end, in reality it has initiated a new forms of domination in which instrumental reason has found new agents and perpetrators who utilize necropolitics¹ and new forms of colonialism that ranges from occupation of the lands of the Others and well as the atrocities committed to native populations by exploiting natural resources which eventually commit environmental crimes against humans and non-humans. Such exploitation of humans, particularly the racial and ethnic minorities is linked to human disgust toward animality, or bestiality--the animality allowing him/her the moral high ground behind such exploitative mechanism.

CONTEXTUALIZING HUNGER AND ABANDONMENT OF STRAY ANIMALS DURING PANDEMIC: THE BRAZILIAN CASE

The COVID-19 pandemic has not only urged all to reconsider the ways humans understand issues of animal welfare but also the threats associated with the human indifference toward animals has forced them to understand how animal welfare is associated with the prevention of zoonotic disease emergence. It has again forced humans to understand the age-old practice of a holistic living, considering all life forms as equal and treating them with care, compassion and respect, because when animals suffer and endure cruelty, they become more vulnerable, becoming the perfect medium for transmission of contagion. Like many other nations in the Global South, Brazilian society has been aware about the relevance of animal rights. While in urban areas of states like São Paulo, Rio de Janeiro, Paraná, Santa Catarina, Rio Grande do Sul, Pernambuco, Paraíba and others there are official and private initiatives, in other part of the nation, people are involved with animal welfare and justice at the personal level. However, there is a need for efforts to mobilize society

¹ The term here is related here to the context developed by Achille Mbembe in his book *Necropolitics*.

as a whole and gain more supporters in order to achieve better results related to animal protection in this case in urban environment.

Brazilian contemporary society has lived alongside struggles and social movements---women's rights movement, indigenous movement, LGBT movement to mention just a few. The animal-social movement exists today in a form of official federal legislation, but more stringent application of those rules concerning punishment of perpetration, exploitation and traffic of wild animals are essential. There is a need for a national coordinating agency and every state works separately. In relation to the stray domestic animals in capitals, volunteers belonging to different social classes, political ideologies and social institutions deal with the problem at their own personal level. The formation of NGOs is usually through private efforts and they hardly count on integral cooperation of the state. However, it is very true that the formation of NGOs can have direct or indirect influence in the construction of policies beneficial for the animals. Although with less participants but no less blunt, animal movement emerged stronger in the twentieth century. Historically, its seeds were planted in the nineteenth century continuing during the first decades of the twentieth century². Despite legal setbacks such as the constitutional approval of the *vaquejadas* or rodeos in 2017, aspects related to moral emotion, disgust and animal activism are important elements to understand the society's participation.

Diverse and contradictory in these specific cases of the rodeos and religious rituals whose actions perform the sacrifice of chickens and goats for example, (later consumed by the community) Brazilian legislation allows space for the continuation of the struggle without abdicating their anthropocentric perspectives and human's interests. The academic incorporation of the debate is also a small progress to the movement, especially in programs of Law such as that of Federal University of Bahia, and also, the elaboration of theses and dissertations in Humanities about the subject in other universities such as Federal University of Paraná, State University of Maringá and Federal University of Paraíba, as well as paper publications in specialized academic journals and the realization of conferences such as Literature and Ecocriticism organized by ASLE Brasil³. But these efforts are small considering the size of the country and free initiatives in predominant capitals. All these efforts together have influenced the development of public policies in favor of animals in capitals besides São Paulo and Rio de Janeiro as historical centers.

Other cities in the northeast such as Salvador, Recife, João Pessoa and Fortaleza, have shown an interest in collaborating individual actions with political and judicial

² The first institution created in Brazil for animal protection was: União Protetora dos Animais (UIPA) São Paulo, 1895, and later Sociedade Protetora dos Animais (1907) and later SUIPA (1930). See the article: "A luta em defesa dos animais no Brasil uma perspectiva Histórica" by Natascha Stefania Carvalho Ostoj. Online publication *Ciência e Cultura*, 69, 2017.

³ Association for the Study of Literature and the Environment <https://asle-brasil.com/>

organizations in order to minimize the different forms of violence against animals. But the number of politicians interested in animal welfare and which forms part of his/her political agenda are very few. Overall, like most other nations, animals are predominantly invisible subjects and do not have a juridical agency. The violence against animals in Brazil is visibly associated with the trafficking of wild animals, roosters and dog fights and abandonment of domestic animals such as cats, dogs, and donkeys in public places. Identified as Frente de Libertação Animal Secção Brasileira (Brazilian Front for Animal Liberation)⁴, and mostly based in São Paulo, the organization came to prominence in 2013 when thousands of dogs meant to be used for experiment in labs, were rescued. However, the struggle to Animal Liberation includes not a wider mobilization of society as a whole but it implies the gradual exercise of individual and collective values such as selflessness and compassion.

Emphasizing the centrality of these assumptions, I want to emphasize the role of empathy and compassion as essential elements to be developed in society beneficial to non-humans. My basic argument here is that empathy and compassion are essential elements necessary to activism, mobilization and cultural change that can possibly change society.

Without empathy and compassion any form of cultural change in the society in favor of the animals could never be achieved. Prior to the organized movement the work of anonymous individuals as “independent” activists was possibly the most compelling form of animal activism. Immersed in a dense atmosphere of self-sacrifice and solitude, most of these rescuers are women⁵ who spent their own financial resources to save domestic animals such as cats or dogs who populate the streets and their neighborhoods. Popularly identified as the “cat ladies”, these women work with other women and men through and exchange their small resources to buy food and medicines for the animals under precarious conditions. Others became targets of criticisms among familial and neighborhood members.

In general, there exists a spontaneous response to animal advocacy in Brazil but clearly the action of only one organized group appears to have taken the form of a movement (Brazilian Liberation Front for Animal Liberation). The various social mobilizations at the grass root level, instead, are plural, independent and many times unnoticeable. Human dilemmas and animosity between activists and the community where they live, lack of resources and hostile attitudes towards the cause such as lack of empathy from the civil society and their institutions in general seems to be the biggest obstacles behind the progress of such efforts. The lack of more organized and institutional efforts and media support were negative elements which could otherwise

⁴ Frente de Libertação Animal Secção Brasileira <http://partidoanarquistainternacional.blogspot.com/2019/>

⁵ Here I take as an example the city of João Pessoa, where I have been working as a rescuer and president of a NGO.

have created a public claim and influence the Supreme Court of Brazil by the time the law in favor of rodeos was approved. On the other side, there was the financial influence and lobbying as part of collective articulation between the agrobusiness and other groups interested in the maintenance of this cruel practice. So, the general picture of animal welfare in Brazilian society is diffuse and incorporates individuals of several tendencies and backgrounds.

To sum up, the situation in general in Brazil demands more social mobilization and more educational awareness to support the several and simultaneous stages in the struggle to supply the grass-roots for the rise of other animal movements in the country. However, it is doubtful if these aspects can really supply the necessities of the cause, especially with the absence of an established elite group that can have at its disposal power and resources.

LOOKING FOR NEW WAYS TO INCREASE THE PARTICIPATION OF ACTIVISTS IN ANIMAL MOVEMENT

Like any movement, participation of various people from different places is crucial to the “spontaneous” development of any movement. Even a couple of decades back, there were several antagonisms among groups and people everywhere directly involved with the cause. Principles of Veganism for example usually intimidate outsiders and potential collaborators who “naturally” do not demonstrate empathy toward animals and the cause in general. Political program such as liberation and social revolution as predominant factors for the transformation of society seems to be in contemporary Brazil an assonant speech in a society which fail to ignore social disparities and there is the need to continue strengthening a discursive agenda for a more egalitarian society where human and non-human alike deserve moral respect.

In this context, an anarchical political stand endorsing the cause as the only viable proposal for animal integrity would be at least discrepant if not a disadvantageous tool in the daily suffering of the animals. Such an argument is to deny that the theoretical foundations of animal liberation and revolution is not a relevant critical thinking to deconstruct and transform society culturally. However, at the present moment, where discredit and skepticism are the prevailing moods among the population, a more efficient political agenda must be put into action. Usually, activists involved in the cause are considered as those who have “official” credentials and act in its name. However, the animal movement does not depend only on the activists but the entire support of the population. Again, though there has been unconditional support from the population, the mass needs to be educated on essential values such as empathy and altruism to the animals.

People has to be educated both formally and informally, something where the collective consciousness of a culture plays a key role, to accept and internalize the fact that an unilateral anthropocentric presupposition of the centrality of humans ignoring all other creation of God to be insignificant and existing for the use of humans is flawed, and it is only through the acceptance of the holism of life within the ecosystem, the various life forms existing mostly through the interplay of the biogeochemical cycle that a modesty might be achieved to have empathy and altruism with animals and marginal humans.

THE CONCEPT OF INDIVIDUAL REVOLUTION, ALTRUISM AND ANIMALITY AS THE BASIS FOR ANIMAL LIBERATION

There are basic differences between the normative fields of animal studies and animal activism. In Brazil and other countries of the Global South, where social inequalities go hand in hand with other forms of discrimination, it is essential to understand the moral implications and the need for empathy and compassion. According to Herzog and Golden, moral thinking usually is guided by rationalization more than reason (Herzog and Golden, 2009). The interrelationship between moral thinking and activism is extremely important for the advancement of the cause for the sufferers, both human and animal alike. Horkheimer and Adorno supported compassion for animals. But such compassion can only arise by identifying and recognizing with the animality of animals, by accepting humans not as something superior, not as God's best creation, but rather as part of the larger animal world. It is only through identifying and associating oneself with the animality of animals that humans might feel that moral revulsion toward violence against animals and human minorities. Horkheimer and Adorno believed compassion not only to be the moral sentiment essential to find solidarity with the suffering humans and animals alike, but that animals can teach humans the key to a good life. In a conversation between Horkheimer and Adorno in the 1950s, recorded by Gretel Adorno, Adorno's wife, both discuss the possibility of animal life to be the source of happiness and freedom:

Horkheimer: "Happiness would be an animal condition viewed from the perspective of whatever has ceased to be animal."

Adorno: "Animals could teach us what happiness is."

Horkheimer: "To achieve the condition of an animal at the level of reflection-that is freedom" (Adorno and Horkheimer, 2011, p. 16).

Horkheimer and Adorno believed that animality in humans has to be cherished and celebrated rather than overcome to move toward a just world.

Besides, it is essential that schools, churches and media should teach and preach key concepts related to animal suffering, care, and love in order to bring a cultural

change in the society. The identification of individuals who show empathy and compassion toward animals is an important element. These individuals though cannot rescue animals, nor contribute financially to the cause, but have sometimes free access to media and can contribute as producers of information or can be relevant to the animal movement as judicial operators, or educators. These paths are seminal ideas that might create new conditions for supporting the struggle for animal welfare and prepare necessary ground for collective action mobilization.

One of the sincerest statements that expresses human condition and its relationship to the animal's subjectivity was expressed by Jacques Derrida in his last talks later reunited as *L'animal que donc je suis* (*The Animal that Therefore I am*). As an attempt to come back to his previous discussions on the subject, the suite as he denominated is profoundly touching by a deep poetical sincerity expressed by interrupted sentences, silences punctuation marks as those expressed by the sentences: "if I had time and if we had time together... we don't have time. If I had time I would try to show how... we won't have time to go very far... If we have time to get there... one should spend a long time to do it... If I had time, I would have liked to do justice... I hope, I have the time and the strength: I'd like to do justice to this text" (Derrida, 2008)

Besides, the motif of time present in the observation, it's essential to emphasize here the poetical function of Derrida's statement since only poetry can convey adequate meaning and express the transi essence of life and the inescapable event of death. Nevertheless, his statement does not exclude human responsibility over animal's destiny emphasized by the words: "If I have time and strength, I'd like to do justice to this text", which implies I do not have time anymore but you may have. So, what are you doing?

The intransigent "deconstruction" proposed by Derrida, as Marie-Louise Mallet defines,ⁱ takes place only when we dispossess ourselves from our humanity and see the animal, taking into consideration "the point of view of the absolute other"; when the borders between humans and non-humans will symbolically be extinguished: "passing across borders or the ends of man I come to surrender the animal, to the animal itself to the animal in me". Here lies the essence of the metaphor of nudity expressed by Derrida. To see the animal beyond myself is to recognize the absolute alterity or as he says "the neighbor next door" (2008, p. 11). But this basic gesture of human's nudity, is to Derrida not a gesture of innocence conveyed by the Edenic image of a garden but a gesture of shame for being under the scrutiny of the other – a cat, a simple cat as an observer, with "a benevolent or pitiless gaze, surprised or cognizant, it does not matter to him. But the experience of the gaze or to be seen by the animal, reverts the cartesian paradigm and the supremacy of the self. Yet, seeing the animal condition, or the way he really is, is to Derrida a gesture of seeing and being seen through the eyes of the other, an ethical prerogative that no more can be denied.

The concept of empathy has been widely discussed at the level of human relations by neuroscientists, psychologists and sociologists. Applied among humans, the term empathy has many different definitions. According to Ricard, “empathy refers to the ability to “feel the other for withing”; an affective perception of feeling for the other” (Ricard, 2015, p. 39). Empathy plays an important role in interpersonal relationships between humans and non-human species, affecting how animals are treated and cared for (Colombo et al., 2017).

The word altruism, *ágape* (in Greek) appropriated in the Christian context means an unconditional love for other human beings while the word *maitri and karuna* in the Buddhist context, is extended to all sentient beings’ humans and non-humans According to Kristen Monroe and Matthieu Ricard, “good intentions are indispensable for altruism, but are not enough. One must act, an action that contributes to the well-being of both human and non-human alike (Ricard, 2015, p. 16).

FINAL REMARKS

As briefly suggested, non-human as well as human oppression are supported by a system of values based on anthropocentrism, a disproportionate exercise of power and lack of empathy. These corrupt and predatory motivators are aggravated in times of crises such the advent of Covid 19 Pandemic and wars. In the case of non-humans, torture and slaughterhouses are normalized phenomenon accepted without contesting. In Brazil the abandonment of animals is significant. The situation of abandonment became more severe due to the death of their tutors during the Pandemic. Animal injustice is perpetrated by the lack of empowerment of activists and Institutions as well as the exercise of an efficient legislation in favor of the animals.

On the other hand, the cultural conditioning based on Aristotelian order and the Judeo-Christian traditions accept human superiority over non-humans as a naturalized feature propagated in the name of Instrumental reason, a tool that needs to be pedagogically demystified between academic discussions as well as activism. The pioneering studies of Adorno and Horkheimer must be followed as one of the steps to struggles in favor of non-humans as well as social and politically oppressed segments of societies. Values such as compassion and the notion that we depend on the environment and the non-humans for the survival of the planet is a statement that cannot be lost of sight.

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Anthropotechnics and Human Evolution: The Case for Bidirectional Biosociology

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Abstract

Biosociology is a promising field of study that can be further advanced by shifting from a unidirectional to a bidirectional perspective. Traditionally, biosociology seeks to explain or understand social and cultural behavior by exploring its causal relationship with the biological underpinnings of our species. While this biological aspect is central to social phenomena, it is often overlooked or dismissed by conventional sociology. However, it is equally important to recognize that causality can flow in the opposite direction. Anthropotechnics—such as artificial selection, genetic engineering, and in vitro fertilization—along with cultural phenomena like self-evolutionary bioethical and biopolitical doctrines, are actively reshaping humankind and other species from a biological standpoint. This process warrants systematic examination through the lens of biosociology, which should incorporate a top-down approach in addition to its traditional bottom-up framework.

Keywords: Biosociology, sociobiology, anthropotechnics, transhumanism, self-directed evolution, evolutionary bioethics.

1. INTRODUCTION

This chapter explores the relationship between anthropotechnics and human evolution from a biosociological perspective. Rather than presenting the results of empirical research within an already established paradigm, I aim to introduce an issue and a new approach. Therefore, a preliminary clarification of the vocabulary used in this work is appropriate.

I introduce the term “bidirectional biosociology” to expand the focus of biosociology on phenomena that are rarely considered within this field. While other disciplines examine certain aspects of these phenomena, I argue that biosociology can and should encompass them.

As is well known, sociobiology gained prominence in 1975 following the publication of *Sociobiology: The New Synthesis* by Edward O. Wilson. This field seeks to explain social behavior by emphasizing the role of biological factors, such as human genetic makeup and the laws of evolution. However, because Wilson was a biologist, many sociologists found his approach and terminology unsettling. At the very outset of his seminal work, Wilson (1975) clarifies that “modern sociobiology is being created by gifted investigators who work primarily in population biology, invertebrate zoology, including entomology especially, and vertebrate zoology.” Yet, in the final chapter, he broadens his perspective from sociobiology to sociology, addressing key sociological issues such as social organization, altruism, sexual life, division of labor, communication, religion, rituals, ethics, aesthetics, and tribalism.

The sociological community did not welcome this approach. Wilson and his followers were often accused of promoting biological determinism, disregarding the role of purely cultural factors in shaping human behavior, and justifying oppression (Ariansen, 2021). However, a small group of open-minded sociologists recognized the importance of linking their discipline to biology and chose to explore the biology-sociology connection under a new epistemological framework and a new label: biosociology (Coca et al., 2021; Coca, 2022; Hopcroft, 2016; Kalkhoff et al., 2012; Machalek, 2007; Mazur, 2005; Schutt and Turner, 2019; Spradlin and Porterfield, 1979; Walsh, 1995).

It is a promising approach and will hopefully consolidate its presence within the sociological community. However, biosociology would benefit from moving from a unidirectional to a bidirectional explanatory path. That “biosociology is an approach that seeks to understand human social behavior by integrating insights from the natural sciences into traditional sociology” (Walsh, 2017) is generally accepted. Still, just as biological factors affect sociocultural phenomena, sociocultural factors also influence biological phenomena. Through artificial selection and, more recently, transgenesis, humans continue to create new biological species while driving others to extinction. Moreover, humans apply these techniques to themselves, modifying their own biological makeup. If this is both true and relevant, then in addition to

developing a bottom-up biosociology that follows a bio-to-socio explanatory path, we also need a top-down biosociology that follows a socio-to-bio explanatory path. “Bidirectional biosociology” would encompass both approaches, while an expression such as “reflexive biosociology” could be used to specifically indicate the top-down or socio-to-bio approach. To avoid any possible misunderstanding, I am not arguing for the replacement of one approach with another but rather for the expansion of biosociology to include a new field of investigation.

Bottom-up (or traditional) biosociology examines how the human genome influences social behavior. In contrast, top-down (or reflexive) biosociology reverses this causal relationship by investigating how social behavior and the ethical values that inspire it can transform the human genome. It is a two-way process characterized by feedback mechanisms. It is also important to note that not all social behavior critically impacts the biological makeup of humans and their evolution. Therefore, I will qualify as “bio-relevant” those ideas and behaviors that demonstrate such an impact in action or potential.

Two key elements of top-down biosociological analyses are “anthropotechnics” and “evolutionary bioethics,” which, roughly speaking, refer to the means and goals of bio-relevant social behavior. Although some dictionaries define “anthropotechnics” as the “discipline that studies and tends to improve the relationship between man and machine” (Gabielli, 2018), according to Peter Sloterdijk, the term should instead refer to autopoiesis, or the self-creation of the human race. I will use the term in the latter sense.

Sloterdijk distinguishes two types of anthropotechnics: primary and secondary. Primary anthropotechnics “aims at shaping the human being directly through civilizing impressions,” and “it encompasses what was both traditionally and in modern times described by expressions such as education [*Erziehung*], taming, disciplining, cultural formation [*Bildung*]” (Sloterdijk, 2017, p. 127). Secondary anthropotechnics, on the other hand, are those that lead to an immediate genetic reform of the species’ characteristics. Sloterdijk (2017, pp. 260-261) wonders, in fact, “whether a future anthropotechnology will advance to an explicit planning of traits; whether humanity will be able to carry out, on the level of the species as a whole, a switch from the fatalism of births to optional birth and prenatal selection.” He also remarks that “these are questions with which the evolutionary horizon begins to clear before us, however indistinctly and frighteningly.”

This observation leads us to ethical considerations about self-evolution. By “evolutionary bioethics,” I mean any system of moral values that has a direct and conscious impact on human evolution, such as bioethical doctrines assessing the morality or immorality of genetic engineering or in vitro fertilization. The concept of evolutionary bioethics is closely related to that of “evolutionary biopolitics.” In my vocabulary, “bioethics” refers to a system of values elaborated and proposed by an intellectual circle (sages, scholars, priests, influencers, etc.), while “biopolitics” is a

set of values imposed by a political body, such as a parliament or government, in the form of obligation, prohibition, or permission. A bioethicist tries to persuade other human beings to behave in a certain way by offering reasonable advice. A biopolitician, on the other hand, tries to force a community to adopt specific behavior through laws and regulations (“biolaw”) and more or less coercive institutions, such as courts, prisons, hospitals, schools, and media. These institutions use tools such as imprisonment, administrative sanctions, compulsory health treatments, indoctrination, and propaganda.

The impact of biopolitics on biosocial behavior is apparent, but bioethical preaching and teaching also influence decisions. Moreover, before entering the realm of biolaw, norms and values are, in any case, developed within a framework of bioethical reflection. Thus, one can consider biopolitics as a specific case of bioethics. From this perspective, biopolitics is nothing more than institutionalized and coercively applied bioethics.

2. ANTHROPOTECHNICS AND SELF-EVOLUTIONISM: A FEW EXAMPLES

The ethical and social implications of biomedicine are crucial for the fate of humanity. For this reason, during the analysis and evaluation phase, it is difficult to remain cold, detached, and disinterested, as our role as social scientists would require, but we must make an effort in this direction.

So, let us organize the facts to provide a solid foundation on which to reason. From the distinction between primary and secondary anthropotechnics, some might mistakenly infer that only the latter influences the evolution of the species. This is not the case. It is important to clear up the greatest misunderstanding, namely that a group of human beings is dedicated to or in favor of self-evolutionism, while the rest of humanity abstains from it or expresses opposition. If we take the theory of evolution seriously, in fact, all of humankind has always engaged in self-evolutionism. The moment we admit that individuals are endowed with “free will”—that is, the ability to choose one course of action rather than another—whatever this faculty may be, from a physical or metaphysical point of view, it follows that, in addition to chance and environmental factors, voluntary choices also intervene to direct the evolution of the species. This “interference” occurs in several ways. Let us see how.

2.1. The evolutionary impact of the resource acquisition system

One way in which human beings have caused their own evolution is by modifying the resource acquisition system. In other words, over the long term, humans have changed themselves through the invention and use of technologies. For the sake of clarity, we are not yet assessing modern-day biomedicine, bioengineering,

or biotechnology. We are talking about the most rudimentary tools, such as chipped stone, fire, weapons, huts, clothing, and so on. Every time hominids introduced a technical innovation, thanks to their own will and creativity, they did not only change the environment—they also changed their relationship with the environment, and consequently, the selective pressure on their genetic heritage.

To provide just a few examples, as our ancestors began to control fire or invented clothing, their need for thick skin or thick hair for survival diminished. An environmental factor such as cold, therefore, took on less selective power. When our ancestors invented tools for tearing meat and cooking it, and passed on the related “meme” to subsequent generations through family education (Dawkins, 2006, p. 192), the jaw of their descendants could gradually become smaller. Generation after generation, in response to the changed relationship with environmental conditions, the skull expanded, and the jaw shrank, favoring the development of intellectual activities and language. Language, in turn, facilitated the spread of technological memes, which further modified the environment, while feedback from the environment acted on both the genotype and phenotype.

In other words, each technical innovation has caused a chain of changes, influencing selective pressure in various ways. Having specific tools at their disposal, for example, humans have adapted to living in more hostile environments. The characteristics of the new environment into which they (more or less) voluntarily moved have once again impacted both the phenotype and genotype. To summarize the issue in a formula, we can say that *humans have technically engineered themselves*, albeit unconsciously and through a process that has lasted millions of years. More precisely, a less evolved type of human has artificially shaped a progressively more evolved type of human. The formula I propose here is somewhat forced because deciding whether intelligence or technology comes first is like determining whether the chicken or the egg came first. To be more precise, let us say that we face a systemic feedback mechanism in which intelligence and technologies mutually enhance each other. This means that bottom-up and top-down biosociology are not opposing perspectives but mutually enriching ones. By adopting one of the two perspectives, one is simply emphasizing one aspect of the process.

2.2. The evolutionary impact of mate selection

A second way through which human beings have guided their evolution is through deliberate mate selection. Not only did our ancestors craft their evolution, but we also do so every day. To recognize this, one only needs to look at how natural reproduction and the traditional process of raising and educating children are carried out. If we reject a rigid deterministic or reductionist approach, we must admit that we are all, to some extent, self-evolutionists in the process of falling in love, mating, and reproducing, as we all voluntarily select the partner we find most appealing. Various

characteristics influence our choices, ranging from physical appearance to moral propensities to intelligence. To the extent that these characteristics depend on genetic heritage, we are, in fact, conducting deliberate evolutionary selection. This is certainly true for physical appearance, and, to some extent, it is also the case for moral and cognitive characteristics. The socioeconomic status of a potential partner is also an important factor in our choices. If the artificial selection of somatic and personality traits is a form of “eugenics,” we must consistently conclude that we are all eugenicists—apart from those who have taken a vow of chastity and those who married out of desperation. In the case of arranged marriages, the eugenicists are the parents of the spouses.

Furthermore, in addition to genes, there are memes—values, ideas, and knowledge—that are transmitted from generation to generation through education. Families, schools, parishes, sports clubs, and other human institutions contribute to shaping the personality of individuals in ways that are yet to be fully defined. If it seems appropriate for someone to speak pejoratively of “manipulation” when the modification directly concerns the germline, how should one judge a “programming” that lasts for almost two decades? In any case, children are subject to a form of brainwashing. They are taught what to believe, how to think, how to behave, how to express their thoughts, and which plans they should have for life. This brainwashing operation shapes their will and influences their future “choices” when they reach the age of mating, once again affecting the phenotype and genotype of other individuals.

2.3. The evolutionary impact of traditional medicine

A third way of directing evolution is through the practice of preventive and therapeutic medicine. In addition to the fact—obvious yet incredibly unrecognized by many—that each generation creates the next one based on aesthetic and moral preferences, which are only partly explainable by biological drives as well as random genetic combinations, one must recognize that we modify the “natural” course of evolution by going to the doctor to treat even the most banal diseases. We can hardly explain this choice in terms of simple bio-to-socio causality. True, animals also cure themselves, but “medicalization” is a bio-relevant cultural phenomenon that has no equivalent in other species.

In the West, medicine can be traced back to Hippocrates or Herophilus, but the statistically evident effects of medical progress became visible only after the Industrial Revolution. In contemporary industrial societies, the quantity of calories children and adults must consume daily is scientifically established, the mass vaccination of newborns is routine, hygiene has improved, and remedies for diseases once considered incurable are available. Consequently, infant mortality has dramatically dropped, average lifespan has expanded, and world population has followed an exponential growth path. There is nothing “natural” in this process. What

is more “artificial” than a voluntary or imposed strengthening of the immune system through vaccination to make the organism more resistant to pathogens? All these choices shape the human species and direct its evolution because they allow children who would have died at an early age to grow up, become adults, and reproduce. Since every medical treatment, including vaccines, produces adverse events with a given frequency, we must also take into account the cases of individuals who have not been able to pass on their genetic heritage to subsequent generations because they died or became disabled following prophylactic immunization or other faulty therapies.

2.4. The evolutionary impact of contemporary biomedicine

A fourth factor affecting the evolution of the species is the complex of discoveries in the field of biomedicine. The new frontiers of biomedicine and bioengineering—such as organ transplants, gene therapies, therapeutic cloning, and in vitro fertilization—could easily be included in the previous section, as they are simply medical treatments. However, as we have seen, Sloterdijk suggests marking a solution of continuity. We do not see a problem in this sense, but it must be clear that these practices do not become intrinsically unethical simply because we categorize them differently. They are a type of self-evolutionary tool, among others. When compared with the previously mentioned types, the only striking substantial difference is that these are conscious and direct self-evolutionary interventions. In other words, biomedicine or bioengineering cannot be condemned on the grounds that they interfere with evolution or manipulate nature. There have always been interferences and manipulations. New techniques are not, by definition, worse than old ones unless one considers things done at random and unconsciously to be better than those inspired by the light of reason.

If what we say is true, the sharp opposition between “natural” and “artificial” methods for making anything—from food to children—that we find in radical ecological or fundamentalist religious literature is pure rhetoric. To the extent that “artificial” means “manmade,” the human species itself is, to a large extent, an artificial species (Campa, 2013).

Having clarified that it makes no sense to stigmatize secondary anthropotechnics as intrinsically evil, the concrete cases in which specific applications of biomedicine can be categorized as extrinsically evil remain open to discussion. This means that it is both legitimate and necessary to question the value horizons within which humans frame the progress of biomedicine. By posing this problem, we shift from an analytical-descriptive discourse to an axiological-normative one. There is a substantial body of bioethical and biopolitical literature presenting different points of view on this matter. Even if we can ideally aspire to a single model of ethical evaluation shared by all humankind, the fact remains that there are different moral orientations and several possible models of evolutionary bioethics

and biopolitics. These different ethical systems deserve to be analyzed from a top-down biosociological perspective, that is, with an eye on the impact they have on biological evolution.

3. PRINCIPLES OF EVOLUTIONARY BIOETHICS

Bioethics can be either evolutionary or non-evolutionary. In the first case, it produces axionormative recommendations by considering the effects of certain practices—such as abortion, euthanasia, contraception, in vitro fertilization, therapeutic cloning, genetic engineering, and so on—on the evolution of the species. In the second case, it focuses solely on the immediate moral aspects of these practices. It must be clear that these practices influence evolution in any case, and therefore, any bioethical position that is applied contributes to shaping the future of our species. I surmise that non-evolutionary bioethicists disregard this aspect because they either do not see it, consider it irrelevant, or perhaps find it uncomfortable. I will return to this point later.

Among scholars and intellectuals who openly discuss the evolutionary consequences of anthropotechnics, some support their use, while others oppose it. Thus, evolutionary bioethics can be divided into proactive and reactive branches. Proactive evolutionary bioethics (PEB) embraces the idea of conscious, self-directed evolution, while reactive evolutionary bioethics (REB) rejects it in principle. As we have seen, supporters of PEB and REB have adopted many different labels. For convenience, I will refer to the former as “pro-enhancement activists” and the latter as “anti-enhancement activists.” Pro-enhancement activists argue that the evolutionary spur can come from within our value systems, while anti-enhancement activists consciously choose to let external factors—such as chance, the environment, or God’s will—guide our evolution.

Pro-enhancement bioethics is “proactive” because it deliberately and explicitly sets the goals and means for self-directed evolution. Anti-enhancement bioethics is “reactive” in two different ways. On the one hand, it reacts to the proposals of pro-enhancement activists, usually with a firm “no.” On the other hand, it is “reactive” because random mutations and the transmission of inherited diseases continue to occur, creating problems that must be addressed at a later stage.

For instance, preimplantation genetic diagnosis (PGD) during in vitro fertilization (IVF), or PGD-IVF, is used to screen for approximately 400 different disorders, including single-gene defect conditions like sickle cell disease, Tay-Sachs disease, and cystic fibrosis. Using IVF in combination with genetic testing might result in significantly lower healthcare costs for prospective parents who carry multiple inherited disorders (Flynn, 2023). However, the issue goes beyond just economic considerations. The cumulative effect of these interventions is bio-relevant

because they contribute to altering the course of evolution, significantly reducing or eliminating specific genetic disorders. Pro-enhancement activists support PGD-IVF for this reason as well. In contrast, anti-enhancement activists argue that eliminating embryos with genetic disorders is intrinsically immoral and that the artificial modification of the genome is dangerous. As a result, they propose accepting the risk of transmitting the genetic disorder to the offspring. This implies reacting to the disease after birth, using traditional therapies. This deliberate decision also results in future generations inheriting the disorder, thereby pushing human evolution in a specific direction. That is why anti-enhancement bioethics, like its pro-enhancement counterpart, is also, whether intended or not, “evolutionary” in character.

From the perspective of top-down (or reflexive) biosociology, PEB constitutes a privileged focus of interest because it pulls the strings of the game. REB would not exist if PEB had not emerged first. However, one cannot deny that REB also holds strategic importance and must, therefore, be monitored. Let us now examine in more detail the features of these two doctrines.

3.1. Proactive evolutionary bioethics (PEB)

A theory of evolution must be in place to think in a self-evolutionary fashion. According to Lucio Russo (2004, p. 163), “the foundations of modern evolutionism, namely the notions of mutation and natural selection, were both present in Hellenistic thought.” This is particularly evident in Theophrastus’ botanical research. The concept of evolution was also present in classical Greece, notably in the philosophy of Anaxagoras and Empedocles. This may explain why a detailed biopolitical program of selective reproduction and offspring rearing appears in Plato’s *Republic* and Aristotle’s *Politics*. A form of theistic evolution can also be found in the thought of Saint Augustine of Hippo (Guinagh, 1946).

However, it wasn’t until the contemporary era that self-evolutionary philosophies and practices truly exploded. After the rediscovery of evolution by thinkers like Jean-Baptiste de Lamarck, Alfred Russel Wallace, Charles Darwin, and Herbert Spencer, many scholars independently developed the idea of self-directed evolution. Some utopian communities and nation-states even began to put into practice the dream of shifting from blind to planned evolution. Many names have been given to this practice. John Humphrey Noyes, founder of the Oneida Community, referred to the breeding of humans to attain certain perfections within the species as “stirpiculture” (Noyes, 1865). The stirpiculture project, which lasted from 1869 to 1879 and resulted in the planned conception, birth, and upbringing of 58 children, was the first experiment of its kind in the USA (Prince, 2017). Later, after using terms like “viriculture” and “stirpiculture” (cf. Shrady, 1883), Francis Galton (1904) introduced the term “eugenics” in an article published in *The American*

Journal of Sociology. “Eugenics” would go on to become the dominant term for the artificial selection of future generations’ biological traits.

After World War II, Galton’s term lost its popularity due to the negative reputation it acquired in the first half of the century. The brutality of the eugenic policies implemented in the United Kingdom, the USA, Nazi Germany, and Scandinavian countries led pro-enhancement activists to rethink the terminology and methods associated with the project. In 1957, biologist and UNESCO director Julian Huxley introduced a new term for self-directed evolution: “transhumanism.” This term is still used today, although some conspiracy theorists have attached meanings to it that were not part of its original definition, particularly the idea that transhumanists advocate for technologically-enhanced social control. In reality, transhumanism was developed from the outset as a libertarian and democratic approach to emergent technologies.

For the purposes of our discussion, we use none of these terms, as we seek a terminology as free from political connotations as possible, avoiding both the authoritarian associations of eugenics and the libertarian leanings of transhumanism. Ancient Greece’s biopolitics, stirpiculture, eugenics, and transhumanism can all be seen as different historical forms of proactive evolutionary bioethics.

At the beginning of the new millennium, many academics embraced the role of steadfast advocates for PEB. Here are a few examples. Among the books arguing for the liberalization of genetic enhancement, *Redesigning Humans* by Gregory Stock (2002) stands out as particularly significant. Stock, a biophysicist, essayist, biotech entrepreneur, and former director of the Medicine, Technology, and Society program at the University of California, Los Angeles School of Medicine, writes in the very opening of his book, “We know that *Homo sapiens* is not the final word in primate evolution, but few have yet grasped that we are on the cusp of profound biological change, poised to transcend our current form and character on a journey to destinations of new imagination.” A few lines later, he explains, “Never before have we had the power to manipulate human genetics to alter our biology in meaningful, predictable ways” (2002, p. 1). In his view, it is our moral duty to embrace this challenge and continue down this path. While acknowledging that his ideas may sound “preposterous,” Stock calls on his fellow humans to engineer their germline and become “more than human.”

Citizen Cyborg by James Hughes (2004), an American sociologist and bioethicist who directed the World Transhumanist Association (now known as Humanity Plus) for many years, also warrants mention. Hughes, currently the executive director of the Institute for Ethics and Emerging Technologies (IET) and Associate Provost at the University of Massachusetts in Boston, observes that “an estimated 7.6 million children are born each year around the world with congenital abnormalities, births that could have been prevented if parents had access to prenatal testing and abortion.” While terminating a pregnancy can be expensive and, in some

cases, illegal, Hughes writes that “fortunately, the painful decision to abort a disabled fetus will soon be made unnecessary by our genetic and reproductive technologies” (2004, p. 13). What if these procedures trigger an evolutionary leap for the species? Hughes (2004, p. xv) is more enthusiastic than worried about this possibility. He states, “Transhumanists believe liberal democracy can and must accommodate the ‘posthumans’ that will be created by genetic and cybernetic technologies.”

In 2009, Julian Savulescu and Nick Bostrom edited the influential volume *Human Enhancement*, which had a significant impact on the ongoing debate. Savulescu, a Romanian-Australian philosopher and doctor, is the director of the Center for Practical Ethics at the University of Oxford and editor-in-chief of the prestigious *Journal of Medical Ethics*. Bostrom, co-founder of the IIEET, is also the director of the Future of Humanity Institute at the University of Oxford. In the volume, the editors pose a crucial question to the contributors: “Are we good enough? If not, how may we improve ourselves? Must we restrict ourselves to traditional methods like study and training? Or should we use science to enhance some of our mental and physical capacities more directly?” They then highlight a growing divide, noting that “a biopolitical fault line is developing between pro-enhancement and anti-enhancement groups: transhumanists, who advocate for the development of a wide range of enhancements and the freedom for individuals to use them to radically transform themselves; and bioconservatives, who argue against substantially altering human biology or the human condition” (Savulescu and Bostrom 2009, p. 1). While the presentation remains relatively balanced, it’s clear that the editors themselves align with the pro-enhancement perspective.

Finally, among recent works on the subject, *Transhumanismo: La búsqueda tecnológica del mejoramiento humano* by Antonio Diéguez (2017) and *Transhumanism: Engineering the Human Condition* by Roberto Manzocco (2019) provide an extensive overview of the transhumanist movement and human enhancement technologies.

In general, pro-enhancement activists begin with the assumption that evolution is not only a fact but also something inherently positive. Evolution is considered good because it leads to healthier, stronger, and more intelligent individuals. Specifically, evolution is viewed as beneficial when it advances the human species by increasing levels of consciousness and intelligence—traits that, while not exclusive to humans, are most clearly exemplified in them. From the perspective of pro-enhancement activists, allowing the spread of disease, physical frailty, and cognitive limitations is not merely choosing a different evolutionary path but actively promoting involution.

For these activists, it is not about turning a description into a prescription, thereby committing the naturalistic fallacy. Instead, it is about rationalizing the evolutionary process in a way that enables it to express its previously unrealized potential. The values that guide pro-enhancement activists in asserting the existence

of humanity's "unexpressed potential" cannot be based solely on observable facts but must also draw from an idealistic and creative dimension.

3.2. Reactive evolutionary bioethics (REB)

The rise of numerous books and articles advocating for a self-directed evolutionary leap for humanity has sparked strong reactions from anti-enhancement activists. These critics oppose the idea of humanity being replaced by a posthuman species. Notable among the leaders of this opposition is Francis Fukuyama, best known for his bestseller *The End of History and the Last Man* (1992), in which he argued that democracy and capitalism represent the final political form of humanity. In 2002, Fukuyama published a book entitled *Our Posthuman Future*. Three years later, in an article for *Foreign Policy*, Fukuyama (2004) pointed out that "for the last several decades, a strange liberation movement has grown within the developed world. Its crusaders aim much higher than civil rights campaigners, feminists, or gay rights advocates. They want nothing less than to liberate the human race from its biological constraints." He concluded with a striking claim: transhumanism is "the world's most dangerous idea."

Similar positions are held by Leon Richard Kass (2003), an American physician and intellectual, who is particularly known for having chaired the Bioethics Council of the U.S. Presidency from 2001 to 2005. Kass, a self-described "old-fashioned humanist," represents the secular opposition to proactive evolutionary bioethics (PEB). His views can be considered a counterpoint to the more progressive arguments of the pro-enhancement camp. Also notable is Edmund Pellegrino (2007), professor emeritus of medicine and medical ethics at Georgetown University Medical Center, who served as the director of the Bioethics Council of the U.S. Presidency. Pellegrino, a proponent of the Christian opposition to human enhancement, has written extensively on the topic, offering a theological perspective on the ethical dilemmas posed by biotechnological advancements.

Many other books have been written on the topic—both in favor of and against human enhancement—and many researchers deserve mention, but the scope of this study limits a more detailed analysis of all contributions. As we have seen, supporters of REB are sometimes referred to as "bioconservatives," as they aim to preserve the current biological makeup of humankind. However, we will stick to our own terminology, as the term "bioconservative" carries certain political connotations.

Anti-enhancement activists have presented a wide range of arguments against genetic enhancement, but we can identify a general orientation within this movement. It is important to note that pro-enhancement activists often dismiss the anti-enhancement perspective as fundamentally irrational, assuming it is rooted in religious dogmas and superstitions. In reality, the situation is far more complex. Just

as some proponents of self-evolutionism adhere to religious faiths—most notably Catholic priest Pierre Teilhard de Chardin (1969)—there are also secular opponents of self-evolutionism.

Religiously oriented anti-enhancement activists view the idea of self-directed evolution as diabolical, interpreting it as a misguided attempt to replace the Creator. Their frequently repeated phrase is that genetic engineering is “playing God.” Some Christian fundamentalists even reject the theory of evolution, or at least the concept of natural selection. However, there are also atheists who are skeptical about planning our evolution. In addition to Leon Kass, French philosopher Michel Onfray criticized transhumanism in his recent book *Anima* (2023).

Secular anti-enhancement activists argue that it took millions of years for nature to produce the current living species, including humans. They fear that tampering with delicate, not fully understood aspects of human biology could trigger uncontrollable chain reactions, leading to catastrophe.

Particularly concerning for them is that the biological transition promoted by pro-enhancement activists occurs within a framework where despotic governments and unscrupulous pharmaceutical corporations are primarily motivated by self-interest. World leaders and Big Pharma could exploit human enhancement technologies to increase their power and wealth, rather than for the betterment of humanity. Additionally, the notion of “improvement” implies the existence of “undesirables,” which evokes the troubling history of eugenics. For anti-enhancement activists, proponents of self-directed evolution are either overly idealistic or potentially complicit in an exploitative system. Even proposals to leave the decision up to individuals rather than governments—unlike the case with historical eugenics—do not allay their concerns. Ultimately, anti-enhancement activists believe that humans should remain as they are for as long as possible.

4. THE MISSION OF TOP-DOWN BIOSOCIOLOGY: A TENTATIVE CONCLUSION

From a biosociological perspective, there is no need to declare who is right or wrong from a moral standpoint, nor do we necessarily need to express a personal preference for either of the two bioethical perspectives. What is sociologically relevant is the fact that pro-enhancement activists are highly enthusiastic about the idea of evolving into a posthuman species and are often surprised by the reactions of anti-enhancement activists. To them, the pursuit of self-directed evolution seems like the obvious next step. However, from the perspective of anti-enhancement activists, this ambition appears to be an abomination. This divide points to a profound cultural fracture in our societies—a moral dissonance that requires a sufficiently detached sociological analysis to understand.

This does not mean that biosociologists must remain neutral in the debate. Criticism can be either values-based or facts-based. Disagreement with value judgments falls within the domain of bioethics, while criticism of factual statements remains within the scope of biosociology. There is nothing to prevent a scholar from being both a biosociologist and a bioethicist, but in such cases, it would be advisable to submit contributions to the appropriate journals, depending on whether the focus is on ethics or sociological analysis.

Let me provide two examples of facts-based criticism that could be directed at both PEB and REB. Libertarian pro-enhancement activists—primarily transhumanists—assert that by guaranteeing individuals the greatest possible freedom, everything will work out for the best. Underlying this idea is an unwavering faith in the intrinsic integrity of the scientific community. However, through empirical research, biosociologists may uncover scientific fraud: for example, a dangerous medical treatment marketed as safe with the complicity of a corrupt regulatory agency. By producing such fact-based statements, biosociologists can challenge the belief that the process will necessarily lead to a positive outcome. Similarly, biosociologists can demonstrate that the anti-enhancement vision of maintaining the status quo in human biology is unattainable. Safety through stability is a delusion. As Heraclitus taught us, *panta rei*—everything flows. Humans will continue to change, whether we intervene or not. In this light, prohibitionists are not halting evolution but simply steering it in one direction rather than another. Once enhancement technologies are available, no one can simply wash their hands of responsibility, as if their choices have no impact on the course of evolution.

There are also bioethical positions that lie somewhere between the two extremes outlined above. Looking at the biolaws of many countries, we can see a tendency toward compromise. Granting individuals the freedom to make choices does not imply the abdication of society's responsibility to regulate those choices, especially when they affect the well-being, happiness, life, and liberty of others. This becomes particularly evident in the realm of assisted reproduction (Campa, 2018a, 2018b). Thus, the tension between *cosmos*—the spontaneous order—and *taxis*—the planned order—continues to resurface as a central issue in bioethics and biopolitics.

Reflexive biosociology must take into account all bio-relevant ideas and behaviors, analyzing what these social and cultural forces have produced in the past, are producing in the present, and could potentially produce in the future as a result of their interactions and clashes.

Regarding the past, studies could explore demographic policies and the medicalization processes across different eras and regions. Michel Foucault's pioneering work on biopolitics provides a valuable framework for such analyses. In the present, it is crucial to examine the statistical incidence of in vitro fertilization combined with preimplantation genetic diagnosis (PGD), considering its long-term evolutionary consequences. The production and consumption of genetically modified

organisms (GMOs) also constitutes a sociocultural phenomenon that impacts species evolution, warranting a biosociological examination. Moreover, the unanticipated consequences of purposeful social actions, a concept introduced by sociologist Robert K. Merton (1936), should not be overlooked. For example, China's one-child policy led to the unintended consequence of a demographic imbalance between male and female populations, with significant implications for genetic diversity. This policy has resulted in many men remaining celibate or seeking partners abroad, further affecting the genetic makeup of the Chinese population. More broadly, politically induced migration, exogamous marriages, and outbreeding trends offer rich areas of study for both top-down and bottom-up biosociology.

Finally, biosociology can play a crucial role in futures analysis, as anticipating the future is an inherent goal of most sciences (Campa, 2023). Parliaments and governments, consciously or unconsciously, are attempting to steer the entire evolutionary process through the regulation of biotechnologies—either through prohibitions or facilitating their development. Since there will always be some margin of freedom, making it unlikely that all individuals will make the same choices once new human enhancement technologies are introduced, a certain degree of uncertainty about our future is inevitable. However, through research methods such as trend analysis, scenario analysis, Delphi techniques, forecasting, and backcasting, biosociologists can work to reduce this uncertainty and better understand where humankind is heading as a species.

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Ethodiversity Reduction in Elderly: a Preliminar Study with Agent-Based Social Simulation

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Abstract

Human being is an organism with a complex social behaviour. In our life we interact with other people, with animals and plants, and also with our environment. In order to improve our understanding of the interaction between ecosystems and humans, the areas of socioecology, biosociology or sociobiology emerged. This chapter framed its epistemological support in this theory. Our research is based on the application of agent-based social models to try to understand the social isolation of the elderly. We also seek to propose policy strategies to reduce it based on the results obtained.

Keywords: ethodiversity, agent-based social models, social isolation, elderly, social health.

1. INTRODUCTION

Human biosocieties are a major complexity system which interrelate and co-evolve with natural environment. Human-environment interactions can be configured as a plethora of functions: individual behaviour, functional diversity (different functions in community) and ethodiversity (different functions in relation with other species and environment) (Cordero-Rivera, 2017). In line with this, human ethodiversity can be considered as a relevant mechanism of evolution and we think that this concept can also be useful in order to explain the social behaviour. In fact, reproduction in isolation can generate speciation in different organisms (Uy et al. 2018) but isolation can also generate biosociological problems. Isolation, in eusociality organism, decrease adaptability at the intraspecific level and reduces ethodiversity (Rivas-Torres et al. 2019). This last perspective allows us to relate social isolation, the objective of this study, and ethodiversity in humans.

Social isolation in a broad sense is one of the most relevant health problems for the elderly. The prevalence of this social phenomenon is estimated to be ranging from 10% to 43% (Nicholson, 2012; Smith & Hirdes, 2009). It has been demonstrated that social isolation generates numerous pathologies in older adults (Choi et al., 2015), including cardiovascular mortality (Olsen et al., 1991) or even increased risk for any cause of mortality (Eng et al., 2002). In fact, Rico-Urbe et al. (2016) suggest that the subjective perception of loneliness has a strong association with health status. This perception could be explained by covariates such as age, gender, marital status, household size and years of education.

Nicholson (2012) affirms that if social isolation is detected early, future morbidity and mortality could be avoided through prevention and mitigation efforts. In this sense Peralta et al. (2017) indicate that elderly who practice physical activities minimize health problems and improve their life quality. Also, these authors consider that interpersonal relationships may influence physical activity participation through social support. These considerations help to reduce health consequences of aging but do not provide understanding on the ontology of social isolation in elderly.

In order to better comprehend the ontology of social isolation in elderly, we consider human isolation as a socioecological phenomenon of fission of a sub-group from a determinate group of organisms. The premise of this article cogitates that this phenomenon occurs by a process of reduction of ethodiversity and a decrease of relationships with other persons. Sueur and Maire (2014) affirm that it is difficult to observe fissions in the natural environment, and difficult to reproduce this socioecological mechanism. Agent-based social simulation can help us to understand the social reality of elderly in the context of socioecological research of the elderly.

2. THEORY AND HYPOTHESIS

In the 21st century, we are facing an “epidemic” (Murthy, 2023) or “geriatric emergency” (Bonanad, 2020) that runs parallel to the more visible public health challenges: loneliness and social isolation in older adults. This phenomenon, exacerbated by the COVID-19 crisis (ca. 2020-2023), poses a significant challenge for modern societies (Murthy, 2023), which must reevaluate and adapt their structures to respond to the emerging needs of an aging population. Thus, it is appropriate to introduce the causes and consequences of this "geriatric emergency" in order to create a more inclusive social model that is attentive to the well-being of older adults.

First, loneliness in old age is not an isolated phenomenon; it is the result of a series of social and familial changes. The aging of the population, combined with the transformation of traditional family models and the evolution of social values, has left many elderly people in a situation of unwanted isolation. COVID-19 pandemic has exacerbated this scenario, further limiting social interactions (Armitage & Nellums, 2020) and highlighting the vulnerability of the elderly (Brooke & Jackson, 2020).

Thus, social isolation is not just an emotional problem; it has tangible consequences on the physical and mental health of older adults. Studies have shown that loneliness can have adverse effects equivalent to serious physiological problems and risky habits such as smoking (Murthy, 2023). The lack of social interaction increases the risk of cardiovascular diseases, cognitive decline, and depression (Arthur, 2006; Novotney, 2019). Fortunately, the growing awareness of this problem has led to numerous initiatives: these range from community programs to government policies, and strategies are being implemented to combat loneliness and isolation in old age (Luna Porta & Pinto Fontanillo, 2021).

2.1. Health, demography, and 'beyond': a holistic view in the Aging Studies

The aging of the population has emerged as a global phenomenon that challenges our traditional social and cultural structures. Therefore, we explore aging from a multidimensional, holistic perspective, addressing not only the biological aspect but also the social and cultural experiences that vary according to context and generations.

The social support network plays a crucial role in defining the identity, well-being, and ability of older adults (Burnett et al., 2006; Flori et al., 2006; Flori et al., 2007; Glass et al., 2007; among others). Aging is a phase of the life cycle where biological, psychological, and social factors interact. Although aging is a universal

process, there is a wide individual variability in how each person ages (Saavedra, 2011).

Traditionally considered a biological process, aging has proven to be a much more complex and integral phenomenon. Its impact on social and cultural structures is undeniable. As the population ages, new dynamics arise in the family, economy, and politics. It is crucial to recognize aging as an experience that varies widely, influenced by socioeconomic, cultural, and generational factors. This multidimensional perspective allows for a richer and more nuanced understanding of aging, underlining the need for inclusive and adaptive policies and practices (Hooyman & Kiyak, 2011).

Furthermore, the perception of old age has evolved. Previously seen under a negative prism, associated with decrepitude and dependence, today, positive aspects such as successful and active aging are also considered. This change in perception is crucial for studies on ethnodiversity and social isolation. It reflects a new way of understanding and addressing old age, focusing on the potential and capabilities of the elderly, rather than their limitations. However, the COVID-19 pandemic has been accompanied by ageist attitudes that have enlarged the level of stress of older people during these years (Fraser & Lagacé, 2020).

In this sense, modern sociological theories have highlighted the importance of the social environment in the aging process. Factors such as social support, community networks, and opportunities for active participation play a crucial role in how people age (Malo & Pagán, 2021; Ponce et al., 2014).

The understanding that social isolation and ethnodiversity are phenomena influenced by the social and cultural context opens new avenues for addressing and improving the quality of life of older people. This holistic approach highlights, therefore, the relevance of creating inclusive and accessible environments that foster social integration and cultural diversity:

It is generally recognized that, with age, most social contacts erode [...] This allows older people to find new roles within the family or in the community. These roles often have marked differences between women and men. Women survive longer and, evenly, experience more years of life with disability and chronic illness than men. Women are also more likely to be directly caring for their partners (or relatives) and are more likely to participate in social networks. With ageing there is a kind of "socio-emotional selection", whereby the elderly concentrate their limited time and energy on the members of their social network (Malo & Pagán, 2021: 28-29).

Old age is experienced differently depending on factors such as gender, ethnicity, geographic location, and culture (e.g., De Pedro-Cuesta et al., 2009; Hooyman & Kiyak, 2011; Minkler, 1990; Morell, 2003; Riley & Riley, 1994; and others). This diversity in the experience of aging is a central theme for understanding ethnodiversity and social isolation in the elderly. For instance, aging in urban

environments may differ significantly from that experienced in rural areas, due to differences in access to services, social networks, and cultural opportunities.

Thus, the field of sociology of aging has undergone significant evolution in its research methodologies (Rodríguez Rodríguez et al., 2012). The use of longitudinal studies, along with qualitative and quantitative techniques, has allowed for a deeper understanding of the dynamics of aging. These methodological advances are essential to underpin the focus on the study of ethodiversity and social isolation, allowing for a more accurate and contextualized assessment of these phenomena.

In this way, the sociology of aging faces several challenges. One of them is maintaining the specificity of the field of study while addressing diverse and constantly evolving topics. This challenge involves continuous reflection on how aging is conceptualized and approached in society. For researchers, this means exploring new theoretical and methodological approaches that can adapt to changing social realities. Additionally, it is crucial to recognize and respond to the emerging needs of an increasingly diverse aging population:

Living alone, having few social network ties, and having infrequent social contact are all markers of social isolation. The common thread across these is an objective quantitative approach to establish a dearth of social contact and network size. Whereas social isolation can be an objectively quantifiable variable, loneliness is a subjective emotional state. Loneliness is the perception of social isolation, or the subjective experience of being lonely, and thus involves necessarily subjective measurement. Loneliness has also been described as the dissatisfaction with the discrepancy between desired and actual social relationships (Holt-Lunstad et al., 2015, p. 228).

Thus, aging - as a multifaceted phenomenon - requires an equally multidimensional approach. By recognizing and addressing the inherent complexity of old age, we can move towards a more inclusive and understanding society, where aging is an enriching and valued experience in all its facets. This multidimensional approach not only improves the understanding of aging but also guides the creation of more effective policies and practices to support the elderly in various sociocultural contexts. The integration of different perspectives and the recognition of diversity in the experience of old age are key to advancing research and understanding of this important aspect of human life.

Therefore, it is important to emphasize how both sociocultural and biological variables, such as gender, marital status, age, and culture, affect ethodiversity and social isolation in the elderly (Centre for Policy on Ageing, 2014; Milligan et al., 2013). These variables can significantly influence the way individuals interact and relate within their social and ecological environments. For example, previous research has shown that women tend to develop more robust social networks than men, which could impact their experience of isolation (e.g., Masi, 2010; Medical Advisory Secretariat, 2008; Poscia et al., 2018).

Similarly, individuals who are married or have a broader family support network usually have a lower risk of isolation. Therefore, a detailed analysis of how these biological variables interact with socio-ecological factors could provide a deeper understanding of ethodiversity and social isolation in old age.

Studies on aging, historically focused on health issues, have begun to transcend this limited approach. While health aspects are crucial, the lack of attention to the opinions, attitudes, and values of older people limits our understanding of the aging experience. Some high-impact studies (e.g., Settersten & Angel) have largely omitted these aspects, focusing instead on the effects of religiosity on health. This gap points to the need for a more holistic approach that recognizes aging as a multifaceted experience.

The call for greater interdisciplinarity in the Sociology of Aging is one of the most persistent trends. Collaboration with disciplines such as demography and biology enrich the analysis and understanding of aging. However, there is a significant gap in the study of non-Western countries, where we often only have limited censuses and demographic surveys. The globalization of the study of aging is essential for a more complete and representative understanding of aging experiences worldwide (Pérez Ortiz, 2016).

Currently, we are witnessing significant demographic changes, characterized by an increase in the number of older people, especially those living alone. This trend can lead to the emergence of unwanted loneliness among the elderly (Fokoya et al., 2020). Choosing to live alone is a social achievement related to increased life expectancy. There is a growing number of older people who are able to live autonomously and independently. However, living alone in old age, without a family or social support network, facing physical decline, illnesses, and low income, can have negative effects on health and well-being, and can result in social isolation (Landeiro et al., 2017).

One of the biggest challenges facing the cultural and biosocial analysis of aging is the need to maintain its specificity as the life course becomes the dominant focus. The tendency to emphasize diversity in aging experiences should not make us lose sight of the common aspects of the aging process.

In Europe, a prime example of demographic aging in the world (see Figure 1), initiatives such as shared training in Gerontology, promoted by the European Union and assigned to the United Kingdom, demonstrate an effort to strengthen education in this field (Rijsselt et al., 2007). Such programs are vital to ensuring that future sociologists are well-equipped to address the challenges of aging from a multidisciplinary perspective.

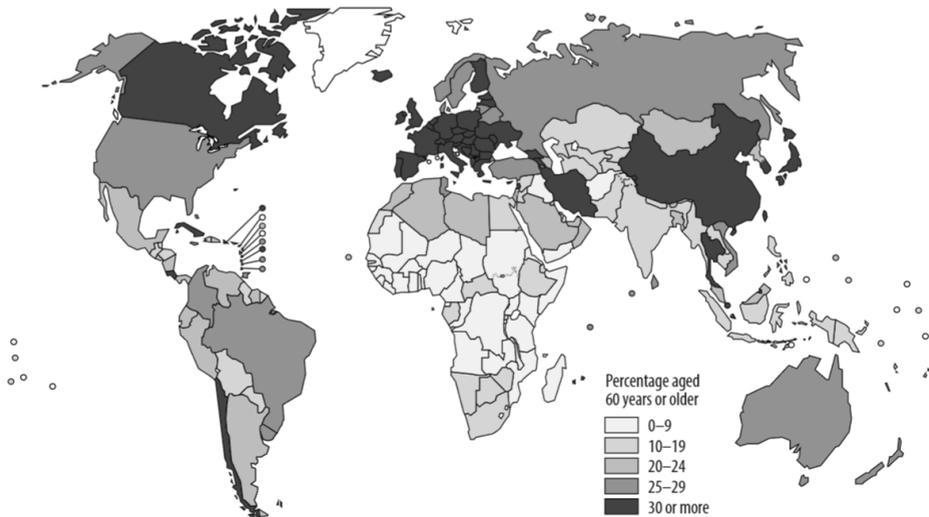


Figure 1. Proportion of population aged 60 years or older, by country, 2050 projections, according to WHO. Adapted from World Health Organization (2015). License CC BY-NC-SA 3.0.

Looking towards the future, studies on aging find themselves at a crossroads. On one hand, they must innovate and adapt to the changing realities of an increasingly aged and diverse population. On the other hand, they need to preserve their core area of study and avoid getting lost in the breadth of their focus. This “failure of success” (Pérez Ortiz, 2016) represents both an achievement and a challenge: sociology’s ability to dismantle traditional conceptions of aging must be balanced with the need to maintain a coherent and meaningful focus.

Thus, the studies of aging are evolving into a complex and dynamic field. Efforts to maintain their relevance and specificity, while embracing interdisciplinarity and recognizing the diversity of aging experiences, are fundamental for their future development. This balance between innovation and the preservation of their core area of study is essential to continue contributing significantly to the understanding of aging in society. By facing these challenges with an open and collaborative mindset, Sociology of Aging can remain a vital and relevant discipline, capable of adapting to and responding to the needs of a constantly changing population.

Over the last years the socio-ecological theory evolved around its principal goal, that is to understand, among other factors, the dispersal tendencies in a population (Aureli et al., 2008). In this sense, socio-ecological research lets us infer the mobility of the given population. In fact, fission-fusion conception in socio-ecological perspective incorporates the degree of spatiotemporal cohesion of a social system (Aureli et al., 2008). He et al. (2019), according with the fission-fusion perspective, exposes that physical configuration of habitat is very relevant to social organization.

Human isolation could be understood as a socio-ecological phenomenon in which spatiotemporal cohesion is broken as the population ages. In this sense, the human group of analysis (elderly) must adapt their behavior in order to drive socio-adaptative dynamics to life in their environment. Thus, our hypothesis about elderly isolation considers that this social behavior could be interpreted as a multidimensional biosocial phenomenon generated from a reduction of human ethodiversity. This study analyzes this phenomenon through an agent-based social simulation. With this simulation, our goal is to comprehend the interactions inside the human group that could condition life of elderly.

3. METHOD: THE SIMULATION

In this research we have developed an Agent Based Social Simulation (ABSS) in order to understand the biosociological behavior of aging. This chapter focuses on an integrated and interdisciplinary construction of an ABSS model that let us structure a causal mechanism of this socio-ecological phenomenon. We agree with Gilbert and Troitzsch (2006) who considered that a model is a correct way to understand the world. In this sense, Davidsson (2002) reflects that the main role of ABSS is to provide different models and tools for agent-based simulation of social phenomena. Several authors (Remesch & Gaube, 2016; Schulze et al., 2017) shows that Agent-Based Models are useful to analyze socioecological systems, and, in this field, agents represent social actors. Then a representation of the social reality can be performed in a computer model.

We used NetLogo to implement and run the ABSS, with the purpose of understanding the intersection between agent-based computing and the social tissue, and also to study the social phenomenon of elderly isolation (Davidsson, 2002). We considered NetLogo because is a multi-agent programmable modeling environment which it helps to configure simulation in a friendly programming language (Kravari & Bassiliades, 2015).

3.1. *Agents and model.*

In the ABSS, human population is modeled as a unique group of agents that present some characteristics defined by researchers. Different agents can have different behaviors, defined within three basic characteristics of agents: ethnocentric (which it has more probability to collaborate with similar agents), altruistic (which collaborate with all agents regardless characteristics of other agents), and cosmopolitan (they collaborate with agent with different characteristics, but not with similar agents). In addition, the socioecological model considers that agents can be conditioned by social variables, such as: contact, relationship, conversation, death

and migration. Agents can generate relationships and then configure new fusion processes. Also, the agents can refuse to configure relationships and increase their isolation through a fission phenomenon. With these items it is possible to analyze the fission-fusion mechanisms in our social simulation. Moreover, our ABSS allows establishing the characteristics of the groups: not-known, known, friend, close-friend, family and close family. This allows us to define the internal cohesion of a group and study how it evolves. In this sense, it was also included a characteristic to control if agents seek relationship or not, to discriminate if this phenomenon modifies our social ecosystem.

The primary objective is to analyse how macro-level social structures arise from micro-level interactions between autonomous agents. Each agent, representing an individual, is endowed with a persistent psychological trait termed way-of-being, which defines their inherent sociability on a spectrum from highly gregarious (1) to profoundly isolated (6). The simulation framework operationalises social evolution through a structured, six-tiered relationship hierarchy, commencing at not-known and progressing through successive stages of familiarity (known, friend, close-friend) to ultimate kinship bonds (family, close-family). This progression is not deterministic; rather, it is governed by stochastic processes influenced by interaction duration, compatibility between agents' sociability traits, and a calibrated acceptance parameter, thereby modelling the complex, non-linear nature of real-world relationship deepening.

The core mechanics of social interaction are grounded in spatial proximity, where agents navigate a two-dimensional grid. Meaningful interaction, initiated under a probabilistic threshold (prob-conversation), triggers a conversation event. This engagement acts as the fundamental unit of social exchange, with its successful completion potentially catalysing a transition in the relationship tier, contingent upon the agents' respective way-of-being levels and a global relationship-coefficient-acceptance.

The resultant data output facilitates the observation of emergent phenomena, such as the self-organisation of social clusters, the resilience of networks to demographic shocks, and the conditions under which certain sociability distributions lead to greater societal cohesion or fragmentation. Finally, it has been included a controller to define the probability of death (random death), slow dying (death by natural cases) and also a ratio of migrations. In this research we have followed data of Eurostat in order to establish these items and then we have not modified it in our simulations.

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We have considered a simulation of 100 years (500 ticks). This period of time allows us to analyze the inner dynamic of our group and also to categorize the inner relational socioecology of our population which is distributed as follows: not-known (64%), known (12%), friends (8%), close-friends (8%), family (4%) and close-family (4%). These categories of relationship have socioecological interest because, as Rouly (2015) indicates (researching about hominids), the identity of self and the others configures the operations of socioecological dynamics of groups. Then, we will know as the ethodiversity is conducting through the inferential research of data of human relationship.

4. RESULTS AND DISCUSSION

After 100 years, and starting with an initial population of 500 individuals, the model results showed that, around 40 years, the population of the universe decreases, especially in the category of not-known. Around 50 years, the number of known increases to 55 people, reducing to 28 at the end of the period of time. The simulation presents a poor number of close-familars: 8 individuals (Table 1).

Table 1: Baseline simulation results (100 Years)

<i>Category</i>	<i>Approx. peak</i>	<i>Final count</i>	<i>Trend description</i>
<i>Not-Known</i>	~500 (initial)	Significant decrease	Rapid decrease beginning around year 40.
<i>Known</i>	55 (at year 50)	28	Increased mid-simulation but collapsed in the second half.
<i>Close-Family</i>	-	8	Low throughout the period.

Source: own data (Net Logo).

After switching off the relationship-seeker option, another simulation was performed. In this environment, the agents achieved similar results. Around 40 years the population of not-known decreases, and the number of close-familars remains low (8 individuals). However, the most significant difference is in the number of knows. In this case relationships are never generated, which, consequently, results in not generating known-individuals.

A third simulation it has been running considers accumulated probability in 20% in all categories. In this case finally the number of not-knowns was 54, knowns 102 and close-family 71 in a population which seeks relationship and starting from 500 individuals.

Overall, these simulations indicate that cooperation between human beings is strongly dependent on our close-family. These results allow us to affirm, because of this, that elderly ecosystem is quite fragile. In fact, ethodiversity tends to decrease over time. In the simulations ethodiversity has always decreased in the second half of simulation.

If we modify the probability of conversation to 30% and run the simulation for 100 years, close-family category remains quite horizontal, but finally decreases to 50 agents. This modification makes sense since people who live in medium or small populations have more probabilities of increasing their relationships. In fact, in a study some years ago, Sørensen (2016) found that the classical claims that social capital (understood as networks of long-lasting social relationships) was higher in rural areas than in urban areas. In this case, the number of known individuals is relatively large, reaching 172 individuals. In turn, not-known decreases slowly with time in the simulation, to 155 individuals in the end. The categories of friend, close friend and relative do not generate any increase in our model.

Comparing the different scenarios indicated, the model suggests quasi-deterministic dynamics (Table 2). Close family is the main category in which human relationships are clustered. When humans live in populations that promote human contact, it becomes easier to generate a less isolating context; indicating that without active intervention, relationships tend to consolidate almost exclusively within the immediate close-family cluster. This concentration creates a fragile social architecture that is highly vulnerable to collapse over time. While environments engineered to promote general social contact succeed in creating a superficially less isolated context by increasing acquaintanceships, they frequently fail to address the core of elderly isolation. The critical problematic of this group seems to be their powerlessness to catalyze the development of meaningful, deeper-tier relationships, such as sustained friendships, close friendships, or extended familial bonds, which are essential for psychological well-being. The simulation suggests the fragility of the inner biosociality of elderly. In contrast, in the developed model we found that friends and acquaintances are the social groups that reduce isolation. This makes sense when considering that overprotection can be a negative factor and imply isolation. Recall that overprotection is related to exacerbated caregiving and, therefore, may imply a certain degree of isolation due to overcare.

Table 2: Comparison of scenarios

<i>Scenario</i>	<i>Key Parameter</i>	<i>Final "known" count</i>	<i>Final "close-family" count</i>	<i>Overall ethodiversity</i>
Baseline	Standard settings.	28	8	Sharp decrease
Relationship-seeker off	No active seeking.	0	8	Very low; no new ties
20% Accumulated probability	Increased interaction chance.	102	71	Significant improvement
30% Conversation probability	High conversation rate.	172	50	

Source: own data (Net Logo)

The simulation outcomes reveal a compelling, quasi-deterministic pattern in social dynamics, indicating that without active intervention, relationships tend to consolidate almost exclusively within the immediate close-family cluster. This concentration creates a fragile social architecture that is highly vulnerable to collapse over time. While environments engineered to promote general social contact succeed in creating a superficially less isolated context by increasing acquaintanceships, they frequently fail to address the core of elderly isolation. The critical problematic of this group seems to be their powerlessness to catalyze the development of meaningful, deeper-tier relationships, such as sustained friendships, close friendships, or extended familial bonds, which are essential for psychological well-being. The simulation suggests the fragility of the inner biosociality of elderly. In contrast, in the developed model we found that friends and acquaintances are the social groups that reduce isolation. This makes sense when considering that overprotection can be a negative factor and imply isolation. Recall that overprotection is related to exacerbated caregiving and, therefore, may imply a certain degree of isolation due to overcare.

This finding underscores the profound vulnerability of the elderly's biosocial world, where an over-reliance on a small kin-based network proves insufficient against the erosive forces of time and circumstance. The model's most significant insight, however, lies in the contrasting effectiveness of different relationship types. It robustly demonstrates that broader, weaker ties—namely, acquaintances and friends—serve as the most critical buffer against isolation. This presents a paradox

related to well-intentioned overprotection, characterized by exacerbated caregiving that limits personal autonomy and spontaneous social interaction, inadvertently becomes a primary driver of isolation. By restricting opportunities for individuals to forge and maintain their own social connections, such overprotection stifles the very processes that generate protective social networks.

The implications align strongly with sociological research, such as that by Ge et al. (2017), which found that connections with friends can be more impactful against depressive symptoms than those with relatives alone. Therefore, the model suggests that policies must look beyond simply creating opportunities for contact and focus on fostering the conditions where weaker ties can organically deepen and where autonomy is preserved to prevent the socially isolating consequences of overcare.

Other authors (Rubinstein et al., 1994; Ge et al., 2017) consider that network of relationships is very important to avoid isolation. Ge et al. (2017) affirms that people with weak connections with friends and relatives have a higher probability to grow depressive symptoms. These authors also consider that the effect of social connectedness with friends on depressive symptoms is more predominant than that of social connectedness with relatives. Furthermore, gender, marital status, age, and culture are other variables that condition the severity of this phenomenon. This seems to suggest that less protectionist behaviours towards older people may increase their sociality, the ethodiversity and reduce their isolation. This is why active living policies that aim to enhance these processes have been so interesting and successful.

4.1. Limitations of this research

While the simulations provide valuable insights into the dynamics of social isolation, it is crucial to acknowledge the inherent limitations of this modeling approach. These constraints highlight avenues for future research and temper the generalizability of the findings. The model necessarily reduces the profound complexity of human relationships into a limited set of discrete categories. In reality, social bonds are fluid, multi-dimensional, and exist on a spectrum of intensity and meaning. The model's parameters, such as a fixed "probability of conversation," cannot fully capture the nuanced and often subjective nature of real-world interactions, which are influenced by unmodeled factors like personality, shared history, and emotional affect.

The agents within the model are homogeneous, lacking individual attributes such as age, gender, health status, or personality traits. The absence of a detailed age structure is a significant limitation for a study focused on an "elderly ecosystem." The model does not simulate the life-course events that profoundly shape social networks, such as retirement, widowhood, or the onset of mobility-limiting health conditions, which are primary drivers of isolation in later life.

Consequently, the model is better suited for exploring dynamic principles and generating hypotheses than for making precise quantitative predictions about real-world populations.

5. CONCLUSION

In this chapter, a social analysis based on agent-based simulation has been carried out. The aim was to study possible social strategies to reduce the isolation of older people. Our analysis suggests that friends can increase the socialisation of the studied group. On the other hand, close family could play a negative role due to overprotection. For all these reasons, we believe that it is beneficial to develop policies that increase the ethodiversity of the social group of older people in order to avoid isolation. It would also be important to develop communication campaigns that avoid or, at least, reduce overprotection and excessive care.

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