



A PRELIMINARY EPISTEMOLOGICAL “HUMAN ECOLOGY” FRAMEWORK FOR UNDERSTANDING THE LIMITS OF BIOETHICS

UN MARCO EPISTEMOLÓGICO PRELIMINAR DE LA “ECOLOGÍA HUMANA” PARA COMPRENDER LOS LÍMITES DE LA BIOÉTICA

PABLO MARTÍNEZ DE ANGUIITA¹, PABLO POSADA AYALA²

1. Universidad Rey Juan Carlos; C/Tulipán s/n Móstoles, 28933. Madrid.

pablo.martinezdeanguita@urjc.es; ORCID ID: 0000-0001-8179-679X

2. Universidad Francisco de Vitoria; Carretera Pozuelo, km 1800, 28223 Majadahonda, Madrid.

pablo.posada@ufv.es; ORCID ID: 0009-0003-9162-6139

ABSTRACT:

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This article tries to set up the epistemological bases of the science of “human ecology”. This term has started to be used as a synonymous of morality, especially in the Catholic moral social doctrine that used for the first time to justify its marriage prospectives. We look at both terms together (human plus ecology) and we propose that human ecology should be a discipline that in the first time study human behavior and population (objective) using the postulates of the science of ecology (method) and then, once a conceptual framework for social sciences disciplines such as bioethics can be settle, could be used as a way to support or not moral postulates in the name of ecology. We conclude by defining which should be the methods of knowledge acquisition, the limits and the validity of what should be considered “Human ecology”, that is to say, the ecology of the humans.

RESUMEN:

Palabras clave:

Ecología humana,
epistemología, ética

Este artículo trata de establecer las bases epistemológicas de la ciencia de la “ecología humana”. Este término ha comenzado a usarse como sinónimo de moralidad, especialmente en la doctrina social moral católica que se usó por primera vez para justificar sus perspectivas de matrimonio. Miramos ambos términos juntos (humano más ecología) y proponemos que la ecología humana debe ser una disciplina que en primer lugar estudie el comportamiento humano y la población (objetivo) utilizando los postulados de la ciencia de la ecología (método) y luego, una vez que se pueda establecer un marco conceptual para las disciplinas de las ciencias sociales, como la bioética, podría usarse como una forma de apoyar o no postulados morales en nombre de la ecología. Concluimos definiendo cuáles deben ser los métodos de adquisición de conocimiento, los límites y la validez de lo que debe considerarse “ecología humana”, es decir, la ecología de los humanos.

1. Introduction

The concept of "human ecology" first made an appearance in Catholic social teaching in Centesimus Annus in 1991¹. John Paul II's considered that the term "ecology" should go beyond its application to the natural environment sciences and use it as a human moral framework:

"Although people are rightly worried — though much less than they should be — about preserving the natural habitats of the various animal species threatened with extinction, because they realize that each of these species makes its particular contribution to the balance of nature in general, too little effort is made to *safeguard the moral conditions for an authentic "human ecology"*. Not only has God given the earth to man, who must use it with respect for the original good purpose for which it was given to him, but man too is God's gift to man. He must therefore respect the natural and moral structure with which he has been endowed"².

The second time "Human ecology" appears in this Encyclical letter is to use it as a moral value, a human fundamental structure, which quickly derives into the fundings of marriage and dignity of procreation:

"The first and fundamental structure for "human ecology" is the family, in which man receives his first formative ideas about truth and goodness and learns what it means to love and to be loved, and thus what it actually means to be a person. Here we mean the *family founded on marriage*, in which the mutual gift of self by husband and wife creates an environment in which children can be born and develop their potentialities, become aware of their dignity and prepare to face their unique and individual destiny"³.

The following time that the term "human ecology" appeared related to bioethics was used by Pope Benedict XVI to affirm that "*when "human ecology" is respected*

*within society, environmental ecology also benefits"*⁴. Following this interpretation of the words "human ecology" Pope Francis wrote in *Laudato Si'*: "*Human ecology implies a profound reality: the relationship between human life and the moral law, which is inscribed in our nature and is necessary for the creation of a more dignified environment"*⁵.

Along the past 30 years, the Social Doctrine of the Catholic Church has transformed the term "Human ecology" that was used in scientific world (see impact factor journal "Human Ecology" for example) as the study the interactions between people and their environment by examining social, cultural, and psychological factors in the maintenance of ecosystems, into a moral framework. In this sense, for authors such as Bachicochi, one of the values of the "human ecology" expression is the fact that "*whereas "human nature" or moral "law" are concepts that sadly have become reified over time (that is, these terms today seem to connote something fixed and imposed artificially from the outside), the term "ecology" may allow that modern mind to reflect, with fewer intellectual stumbling blocks, upon the dynamic and complex internal structure of the human person and of human experience"*⁶.

And having arrived at this point, we wonder if popes just wanted as Bachiochi states to use the word ecology to "*draw a cultural analogy to natural ecology"*⁷. In opposition to this view, that could be described as "*if people cannot admit moral law or human nature, let's give it another more fashioned name such as ecology"*⁸, we

4 Benedict XVI. *Enc. Caritas in veritate*. 29 de junio. 2009

5 Francisco. *Enc. Laudato si'*. 24 de mayo. 2015.

6 Bachicochi, E. 2018. On Human Ecology. *Conversatio*. Based on her intervention in Portsmouth Institute's 2017 Summer Conference, "*Being Human: Christian Perspectives on the Human Person*." Portsmouth Abbey, and Saint Louis Abbey. 2018.

7 Ibid.

8 Ibid. She continues her paper stating that "*the analogy to natural ecology also allows, even calls for, empirical and scientific validation. Just as we can measure toxins in our waterways, we can use social science to empirically corroborate the destructive "downstream effects" of the pill, pornography, and fatherlessness on real women, men, and children. The ecological analogue can better reveal, up and against the prevailing libertarian view, that the supposedly "harmless" acts of solitary individuals, when popularized among the population, can have a deeply harmful ecological—or cultural—effect. She concludes that "an ecological approach is one that is by nature interdisciplinary and that seeks to integrate diverse perspectives to achieve a wider angle"*.

1 John Paul II. *Enc. Centesimus annus*. 1 de mayo. 1991.

2 Ibid.

3 Ibid.

propose that "human ecology" is much more than that, is a new discipline of knowledge, we even dare to say a new branch of science that has to be developed according to its own nature, and only if this happen, John Paul II, Benedict XVI or Francis words will be read in a fair and wide enough context to understand all what lies behind them, and not just as "old wine in new wineskins".

In order to understand the very own nature of "human ecology" we can start by understanding the science, ecology and the understanding of why we are currently shifting in the use of the ecology adjective for nearly any known discipline. After this analysis we will come back to the papal idea of marriage as a core issue of "human ecology" and will extract some conclusions.

2. Can be "human ecology" a serious scientific discipline?

Scientific laws or laws of science are statements, based on repeated experiments or observations, that describe or predict a range of natural phenomena. Sometimes they can be formulated as one or several statements or equations, so that it can predict the outcome of an experiment. In the world of physics, a clear example is the law of universal gravitation. This can be states as that every particle attracts every other particle in the universe with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between their center:

$$F = G \frac{m_1 m_2}{d^2}$$

Sometimes these laws have a more difficult translation into equations. In fact, some physicians argue that physics is the only real science. All the rest of subjects are mere derivatives of these primordial physics science. Chemistry in fact could be explained — they argue — based on the laws of physics. But when we come to the existence of life in earth, — the mystery of mysteries as Charles Darwin defined it —, and who knows in the universe, sciences tend to not have such a solid base. Sciences can still provide laws (statements, based on repeated

experiments or observations, that describe or predict a range of natural phenomena) but they have more problems. In biology and ecology mathematical statements not necessary predict with certainty events. There are many additional facts that cannot be included totally in an equation (including contingencies). This is the case for example of the Lotka-Volterra predator prey non-linear first order differential equations proposed separately by both authors in 1925 and 1926 that tend to explain the evolution of an animal population changes over time. These populations equations were later on verified when studying the abundance of a predator (in this case the *Lynx canadensis* and its prey (*Lepus americanus* or rabbit), based on the series of sold skins by trappers of the Hudson Bay Company among 1845 and 1935⁹.

As we can see, in specific contexts, these equations have the power to explain and predict population dynamics. They are not necessary law as of the population ecology (the study of these and other questions about what factors affect population and how and why a population changes over time), but they are able to give us and understanding, explaining, and predicting species distributions. Instead of laws, these equations are called models and the branch of knowledge that deals with them is the ecological modelling, the construction and analysis of mathematical models of ecological processes, including both purely biological and combined biophysical models. That can allow the understanding complex ecological processes and predict how real ecosystems might change.

When we continue studying the evolution of life in earth, we find as Sofocles stated in *Antigona* that "there are many mysterious things, but none are as mysterious as man". And then, it seems that ecology does not apply to us. But this cannot be true. Humans are affected by gravity (just try to step out of a window!), and even if ecology does not have such clearly stated laws such as physics, we live in an ecosystem, we are able to subsist due to a flow of constant energy (the sun) plus other energy inputs that makes able to storage energy

⁹ Pikovsky et al. *Synchronization: A Universal Concept in Nonlinear Sciences*. Cambridge Nonlinear Science Series. Cambridge University Press. 2001.

among other things in carbohydrates that feed us and our machines. Forgetting about this is like stepping into a window without any security system. Therefore, we are subject to the laws (even if they are not well stated) of the ecology, and therefore subject to the laws of population ecology.

In human terms, the abundance of human beings is mostly a consequence of patterns of reproduction, given the absence of predators and our ability to produce extra energy since the industrial revolution gave us the opportunity to transform fossil fuels (and later on others) into available energy and food. This explains why human population has multiplied since then¹⁰.

This growth does not seem to come from an exponential continuous growth, but it can be explained throughout the provision of energy to the human ecosystem (or society) that started 250 years ago in a punctual and breaking way. As it seems that there is no similarity with any other animal growth (beyond the quick exponential growth and posterior deaths of certain plagues), it seems that we are living a unique moment of the world population evolution. But instead of trying to understand our current society using these tools, we tend to analyze human population growth (and the management of the resources around or economy) in terms of other much lesser detailed sciences, sociology or economy, whose postulates are even much more weeks than those coming obviously from physics, but also from ecology. And we find limitation such as the fact that we have no idea of long-term patterns for example in economy as far as economy in its postulates is constructed by short term preferences. So, what can try to tell us human ecology about our current human ecosystem or society?

3. What is ecology?

Ecology is defined as the scientific study of the processes that influence the distribution and abundance of organisms, the interactions among organisms, and the interactions between organisms and the transformation and flux of energy and matter. Human ecology should

¹⁰ Ikeda, R. «What Do You Think You Are? Identity in the Anthropocene». 2016. 10.13140/RG.2.1.2491.5448.

be therefore understood as the ecological bases and conditions including reproduction patterns, that make human life flourish and continue in the world, and therefore to understand the distribution and abundance of human beings through their interaction with their own species among others, as well as with energy and matter.

One specific branch of ecology will be relevant here, the behavioral ecology, that examines the evolution of behaviors that allow animals to adapt to and thrive in their habitats. As we have seen there are two broad categories of behavior—learned and instinctive. Because behavioral ecology is an inherently evolutionary subject, much of the way in which practitioners study behavioral ecology is structured around evolutionary mechanisms and adaptive explanations of behavior. In fact, behavioral ecology is an inherently evolutionary subject, much of the way in which practitioners' study behavioral ecology is structured around evolutionary mechanisms and adaptive explanations of behavior, and behavior is important for ecology because many ecological outcomes are the result of behavioral processes. The interactions of organisms and their environments arise from behavior.¹¹

Human Behavioral ecology may be defined as the study of the evolutionary ecology of human behavior. According to Cronk¹² its central problem is to discover the ways in the behavior of modern humans reflects our species history of natural selection. Its areas of traditional concern have been population regulation, foraging, reciprocity, redistribution, kinship, marriage, childcare and socio-cultural changes among others. This evolutionary biological study of human behavior has been given other names besides human behavioral ecology such as evolutionary ecology, biosociology. Biocultural science, human ethology, evolutionary biological anthropology, or human behavior studies.

¹¹ "Many overt rhythms are governed by underlying high-precision biological pacemakers. These living clocks play a vital role in the adaptation of organisms to environmental cycles". DeCoursey, P. J. The behavioral ecology and evolution of biological timing systems. In J. C. Dunlap, J. J. Loros, & P. J. DeCoursey (Eds.), *Chronobiology: Biological timekeeping* (pp. 27–65). Sinauer Associates. 2004.

¹² Cronk, L. 1991. Human Behavioral Ecology. *Annual Review of Anthropology* 20: 25-53. 10.1146/annurev.an.20.100191.000325.

Human behavioral ecology in action includes the use of sex allocation theory and the polygyny threshold model to assess the adaptiveness of mating practices and patterns of parental investment in offspring¹³.

4. Why everything has to be now "ecological"?

This article tries to explore what could "human ecology" teach us in relationship to subjects we have just considered as an only human domain such as social sciences like economics, politics or sociology.

Even further, what can this scientific approach say about human subjects and its accumulated knowledge such as love, marriage, religion, or spiritual and moral values? We suggest that in the same way ecology has been used for to establish boundaries for social sciences such as ethics, politics, economy, sociology, we are in the middle of a long run stage of rediscovering our own philosophical and theological anthropology in such a way that can correspond with the basic principles and boundaries of ecology. By this correspondence we do not mean to reduce other social sciences or human knowledges (such as culture, religion or theology for example) to the boundaries of ecology, but to set a framework where these knowledges or social sciences can be analyzed in order to see if they fit inside of the postulates of ecology in the same way social sciences have started to be related with the laws of ecology.

Probably the two firsts author to explore the ecological boundaries of social sciences were the 1973 Nobel Prize Wassily Leontief and Georgescu-Roetgen¹⁴, the first one using an economic approach (the physical boundaries of Input-output economic models) and the second one a thermodynamic one (the relationship between entropy and economics). By both sides, the conclusion was clear: "*Economics could no longer be studied as if it existed in the vacuum*"¹⁵. Since then, Donella Medows wrote in 1972 the "Limits

to Growth" and many more authors have created the "Environmental economics" as a branch of the economics following Daly¹⁶, meanwhile others following Odum¹⁷ postulates have developed the ecological economics looking economy with the glasses of an ecologist. This "bath of humility" is in line with the famous HEP-NEP shift of the proposed sociological paradigm to explain modernity by Catton and Dunlap¹⁸: "*Current trends in society cannot be longer understood just by the Human Exceptionalism Paradigm (HEP), but requires to be fitted into the New Environmental Paradigm (NEP)*".

This shift have also started to take place in the arena of bioethics since the land ethics of Aldo Leopold¹⁹. Although published in 1949, started to be accepted by ecological concerned groups specially after May 1968 Paris revolt. Anthropocentric ethics was slowly left behind when trying to define what was good or evil in the relationship between man and land: "*land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land*"²⁰. In its place, biocentrism developed all his potential after Lovelock published his Gaia hypothesis in 1979: "*The entire range of living matter on Earth from whales to viruses and from oaks to algae could be regarded as constituting a single living entity capable of maintaining the Earth's atmosphere to suit its overall needs and endowed with faculties and powers far beyond those of its constituent parts*"²¹.

Compiling all this flourishing shift of scientific paradigm in economics, sociology or ethics could perhaps lead us to rename the decade of the seventies in the academic world as the decade of the discovering of our

13 Fraser B. and Sterelny, K. 2015. Evolutionary Approaches to Human Behavior: Philosophical Aspects., in *International Encyclopedia of the Social & Behavioral Sciences* (Second Edition), Elsevier.

14 Georgescu-Roetgen N. *The Entropy Law and the Economic Process*. Cambridge Mass: Harvard University Press. 1971.

15 Ibid.

16 Daly H. E. *Toward a steady-state economy*. W.H. Freeman. 1973.

Daly, H E. *Steady-state economics / Herman E. Daly* Island Press Washington, D.C. 1991

17 Odum, H. T. 1973. Energy, Ecology, and Economics. *Ambio*. 1973; 2(6): 220-227.

18 Catton, W. and Dunlap, Riley. <<Paradigms, theories, and the primacy of the hep-nep distinction>>. *The American Sociologist*. 1978; 13. 256-259.

19 Leopold, A. *A Sand County Almanac and Sketches Here and There*. Oxford University Press. 1949.

20 Ibid.

21 Lovelock, J. *Gaia: A New Look at Life on Earth*. Oxford: Oxford University Press. 2000.

society limits. Even though, there are still some other areas that have not yet shifted to what NEP paradigm can offer to encircle and at the same time enlarge their boundaries of knowledge. We consider "human ecology" as both the study of this boundaries as well as the basic science that can frame philosophical anthropology postulates to help us to build a basic non-relativistic human research framework. In order to do so we will start by understanding how can we enlarge these boundaries using science.

One example of these possibilities can be developed in the "human ecology" analysis of new emerging fields such as feminism anthropology. Its basic postulate proposed by Simon of Beauvoir in her Famous The second sex book "*One is not born, but rather becomes, a woman*"²² where she argues that femininity does not arise from differences in biology, psychology, or intellect. Beauvoir obviously was born much more before of the eighties, the decade of limits, but unbelievably, current trends in many of the branches of feminism, including ecofeminism, do not flow trying to state where are the origins of femineity in ecology, but rather to simply state that femineity is self-referential, isolated form any other branch of scientific knowledge. In Martínez de Anguita (2023)²³ can be read a first reply to this question that needs to be further developed.

5. Two examples of human ecology as a framework applied to economy and ethics

At this point, when moving from biology and ecology into merely human branches of knowledge, we tend to commit two errors. First one is to believe that human systems are isolated form their natural surrounding world. Second is to give morality a self-human based origin. We explain both with two examples.

a.- Macroeconomists tend to study the economic growth throughout the Circular Flow Model as isolated from the environment. And then they define the Gross Domestic Product (GDP) as consumer spending

²² Beauvoir, S.D. and Parshley, H.M. *The Second Sex*. New York. Knopf. 1952.

²³ Martínez de Anguita, P. <<El origen de la ternura>>. *Vulnerabilidad, persona y Bioética*. Madrid. Tirant Leblach. 2023.

plus government spending plus business investment plus the sum of exports minus imports. It is represented as $GDP = C + G + I + (X - M)$. This GDP does not take into consideration any decrease of the natural capital nor any other environmental consideration, and therefore it does not have the ability to predict when most of the GDP could be lost by a quick fall in resources provision. The city of Ephesus is a typical example of how the heart of a local civilization can disappear when its resources are not taken into consideration (today is an abandoned city as the bay where its port was located was filled up with sediments due to the increase of pressure provoked human local population growth).

b.- Concerning morality, it is interesting to look for example to the origin of the virginity. It did not appear in central Africa where resources were abundant, but it is among Semitic tribes where human life was based on cattle, and therefore limited by the ability of cattle to transform primary production (local scarce pastures) into secondary production (meat available for humans) where this concept appeared. We could therefore argue that virginity was born as a human way to control its population. Children should be born in already established families to assure their subsistence.

These two arguments do not imply that GDP is or is not a good measure of a local economy in each moment and give us an indicator of how society is doing concerning the increase of his wellness. Also, the amount of pasture and number of goats and marriage relationship does not imply the beauty of virginity as a spiritual way of life.

They mean that beyond many economic, sociological, or even moral issues there is an underlying ecological basement that many times is not taken into consideration. It's great to grow in economic terms but economy itself is not able to define the limits of the applicability of its self-defined or autoreferential laws. It is fair to live according to a human morality, but deepening into its ecological root perhaps can help us to redefine what is good and bad, or at least why they are good and bad according to our biological and eco-

logical human condition and understand how morality corresponds to our human ecology. This correspondence has to take place if we want to live in the truth of what we are. It does not imply that an ecological fact they cannot have an even superior spiritual dimension, but it must explain how this spiritual dimension took place in the world and human evolution. Humans are not apart from the world. Its morality has a history, and evolution. We postulate that anthropology without ecology is a one-eyed view of human reality. In order to refute current autoreferential or relativistic perspectives in social ethics or anthropology or even theology disciplines, we consider that a requisite for these knowledges to be considered really valuable must be their correspondence with the human ecology framework, as part of its epistemology. According to Ceberio and Watzlawick²⁴: "*branch of philosophy that deals with all the elements that seek the acquisition of knowledge and investigates the foundations, limits, methods and validity of the same*", or simply Aristotle²⁵: "*any science must aim to know things in their essence and their causes*".

6. The methods of "human ecology"

So, the question becomes how can we discover from this ecological projection of the human being what is properly human to us? Evolutionary biology is one of them. But as we saw in the fields of economics, we can study the boundaries of economics and find ecological limits (Leontief Approach²⁶) or we can look at economy with the glasses of ecology (Georgescu Roetgen²⁷) we could use two methods. First one to start from what is human and try to separate what has an ecological founding De Waal²⁸ propose for these analysis three methods based on primatology:

24 Ceberio, Marcelo y Paul Watzlawick. . << *La Construcción del Universo*. >> Herder. Barcelona. 1998.

25 Aristotle. *Metaphysics*. Trad. Hugh Lawson-Tancred, 1999. Penguin Classics

26 Leontief, W. Environmental Repercussions and the Economic Structure, An Input– Output Approach. *Review of Economics and Statistics*. 1970; 52: 262–271.

27 Georgescu-Roetgen N. *The Entropy Law and the Economic Process*. Cambridge Mass: Harvard University Press. 1971.

28 Waal, F. de. *Different: What Apes Can Teach Us About Gender*. Traducido al español por Tusquets editors. Barcelona. 2022.

- a. See what is common to us in all cultures (before differentiation)
- b. See how we are before being affected by culture (young children)
- c. Compare with our closest biological relatives (bonobos and chimpanzees) to continue searching for "communalities" with other hominids, primates, mammals and so on (genus, family, order, class...)

From an ecological point of view, we should consider the population ecology and behavioral biology probably. Understanding how different species evolve from instinct to behavior can be an essential help to also understand our step into moral behaviors.

7. What love has to do with this?

As Tine Turner would put, at the end we also want to know what love and marriage, and bioethics has to do with it. Does Human Ecology provide a framework to have a better understanding of the relationship between ecology and morality? To start this specific approach, we could start by stating that in biology and ecology sexual relationships are an evolutionary consequence of the basic fact of any living creature, death. For a reason we have not been able to state clearly yet (at least from any type of science), all living things tend to die. From biology and ecology, we know that death at the same time is the greatest "invention" of life as it procures its renewal, and therefore an evolution in the same space. Without death there would not be biodiversity nor nearly life in earth as adaptation could not have happened. Paradoxically, death expands life in space at the same time allows its continuity. Reproduction is therefore the "law of life" given the fact that death exist. In fact, everything alive is designed to reproduce and to fight – compete – for life (without competence there is no evolution). So, reproduction could be defined as the definitory law of life for any specie, for any individual. Reproduction defines us as male and female in most of the species of the world, and certainly in the most evolved ones such as mammals as we are. We are evolutionary built to reproduce ourselves. As we

are going to die, this is the mechanism that life itself must perpetuate.

Therefore, what is marriage from an ecological point of view. It is simply a reproduction strategy. This, again as in the case of virginity, does not try to reduce a reach human relationship – but to explain its origin. In fact, from a theological perspective, we see much more interesting that if there has been a God beyond all this evolutionary process, witnessing how our more beloved moral and mystical believes comes from nature precisely opposes to the idea of a bungler creationism where at any many moments the Big Mechanic had to re-conducting the evolution. In fact, it seems more as Teilhard de Chardin would affirm that universe tend to evolve into a more conscious states where the fundamental principles simply arise as a flower does it from its plant stem. As if there were an even more fundamental law hidden beyond the physics, biology and ecology among others; love and beauty – our most cherish human objectives and the base of our main moral principles arise from its stem through natural evolution²⁹. We wish we could state this intuition based in science instead of reason (intuition is the vertex of reason) but we cannot do it at this moment. In fact, when we contemplate the perfection and beauty of the world, we tend to see God more as a living presence of beauty and love rather than a mechanic fixing its invention at different moments in order to make it compatible with our deeper moral intuitions. We see even more rational to see every higher point of human desire as a flower stemming from creation throughout the own creation, through their own processes and laws in the same way an unexpected flower blooms out from a branch breaking any prospective of a previously estimated for example linear progression at the same time it explains the whole plant.

Beyond coming back to our main argument, we would like to use this last example not only for understanding how love and beauty arises from the very and still unknown nature of life, but also the impor-

tance of reproduction. In human terms it is simply the flower that explain us. Unexpected sometimes, unwilling others, but with the power to explain our human reality, our sexuality, or our male- female differences, and in ecological terms, the different patterns and social values that society has followed during its story. In somehow, human history is the intersection between reproduction and thermodynamic conditions of availability of resources and energy as we will try to explain later. Summarizing understanding that virginity appeared in our human world as a value through specific semiarid conditions and as a way to control human population, does not reduce the value of virginity, but roots it in the world without moving the possibility of a deeper and unknown meaning for sciences such as the ecology.

From this point of view, in terms of population ecology, marriage could be considered as a human reproductive strategy. And this hypothesis is interesting as it can provide us with an example to test the basic theory we want to pose today. Human realities such as marriage are ecological realities as far as they fulfill ecological laws. We can really test this question by researching how the practice of marriage relates to the success of human reproduction. If marriages oppose to the reproductive success (as an ecological law, then we could say that we are morality does not have in common ecological roots with this world. But if it does, we could say that in the same way we are not stones, rocks and humans both follow the laws of gravity, and even though we are not just animals, eagles and humans both follow the laws of ecology, and this can help us to achieve a better understanding of our human dilemmas.

According to this hypothesis, ecology should show us whether or not marriage is merely an anthropological question disconnected from the laws of population ecology: we should ask ourselves if marriage itself is (or is not) the most efficient way to achieve reproductive success (and how this reproductive success should be defined). Understanding marriage as a successful ecological strategy can order many questions that are for the most part judged solely from a moral perspective

²⁹ Prum, R.O. *Evolution of Beauty: How Darwin's Forgotten Theory of Mate Choice Shapes the Animal World- and Us*. Doubleday. 2017.

without relation to the laws of ecology; these provide a wider framework in which they can be analyzed. Are love, fidelity and virtue spiritual things that only belong to the human sphere, or are they also conditions linked to the survival of offspring?

8. Human ecology as a new field to explore

Deeping into this argument we can apply this hypothesis to other human realities.

Is religion something irrational or that belongs to a higher sphere disconnected from human ecological realities or are they among other things a way to make the intuition of these ecological laws intelligible to societies? Are religions encouraging successful reproductive behavior through human morality? Does the current expansion of non-reproductive sexual behaviors in Western societies (among others) also correspond to ecological patterns? Is love just a human, spiritual response, or does it suffice to explain and justify marriage? Is it also the answer to the questions that human ecology must face? Are love and virtue necessary conditions for reproductive success ecologically? Is marriage based in love and virtue the best ecological answer to the successful transmission of human life?

And from these questions we can jump into to other much more difficult to answer. Do not reproductive behaviors such as homosexuality or the current social perception of sex isolated from reproduction has something to do with our sudden (in ecological measure of time) human population growth? Can we consider our sexual morality therefore to a previous desire to grow (grow and multiply – form the genesis) before industrial revolution? Or even a more difficult question. Are all our moral principles immutable or they depend still unconsciously on our still unknown ecological condition? Can these moral sexual principles evolve (or are they already doing it) as they can be considered because of a given ecological moment? Are non-reproductive sexual behaviors a simple expression of Darwin first law of natural selection given the absence of predators? If so, what are the deepest roots of morality or in other terms? At this point we have more questions than answers, but we are

sure that the serious study of human ecology will help to put some light into these questions.

9. Human ecology and bioethics

Deriving moral consequences from whatever can be found according to human ecology must not be understood as a direct cause-effect relationship. Morality should not be considered a direct causal effect of developments in human ecology. It is more complex than that. If we were to do so, we might be asserting that something is good or right simply because it is part of discoveries in "human ecology," which could fall into either the naturalistic fallacy (the claim that it is possible to define good in terms of natural entities or properties such as pleasant or desirable) or the "appeal to nature" fallacy, which proposes that "a thing is good because it is 'natural', or bad because it is 'unnatural'." As Peter Singer³⁰ argues, the moral permissibility or impermissibility of an act should not be assessed by appealing to what is "natural" (which could simply be an opinion), but rather because of its own merits.

But there is something we can morally deduce from the potential science of "human ecology". If we can clearly ascertain that certain postulates are not compatible with human ecology, we can uncover false statements in the opposite direction. We cannot assert that following the law of gravity is good simply because it is a natural physical law, especially when standing atop a skyscraper, where falling would result in the loss of life (which is not good). However, simultaneously, we can argue that if someone claims that falling from a skyscraper has no consequences (not even moral consequences), or that it is merely a cultural leap devoid of consequences, they are not telling the truth (falling has very real consequences). One example can illustrate this argument in the realm of human ecology: Some feminist thinkers have advocated the notion that society has instilled bias against female babies to subjugate women. Therefore, giving a truck to a male baby and a doll to a female one is seen as a way to condition their gender roles

³⁰ Singer. P. *Practical Ethics* (3rd ed.). Cambridge University Press. 2011. pp. 60–61. ISBN 978-0521707688.

from the very beginning of their lives. What can human ecology say about this? De Waal³¹ illustrates his behavioral experiment by giving a puppet and a toy truck to young gorillas (males and females). The result is that males preferred the trucks while females embraced the puppets. Following primatologist De Waal, the "evolutionary perspective" of "human ecology" is based on its three basic statements previously defined (a fact is part of our "human ecology" when it occurs in all cultures before differentiation, when it occurs in all children before being influenced by their respective cultures, and when it also occurs in our closest biological relatives (Hominidae)). If something happens in both gorillas and human babies, the reason for this behavior cannot be attributed solely to a layer of human culture that should be culturally removed or improved according to a moral discourse, but rather to a "human ecology" fact. In this case, we should consider, for example, Darwin's law of sexual selection to understand the reciprocal construction of masculinity and femininity with their ecological characteristics that occur in Hominidae (the taxonomic family that includes orangutans, gorillas, chimpanzees, bonobos, and modern *Homo sapiens*, that is, us). This implies that the cultural feminist argument "allowing girls to choose puppets and boys trucks is unnatural and therefore morally wrong" is also a "natural" fallacy. More specifically, the "appeal to nature (appealing to gender egalitarianism as a natural moral norm to improve society)" should also be considered a fallacy as it does not belong to our human ecology.

But beyond helping to unmask current fallacies about us, the development of "human ecology" can also assist us in positively delving into moral concepts such as marriage, virtue, or love. For example, the question "From a human ecology perspective, is marriage just one possible way to reproduce, or is it the most suitable for the continuation of the species?" is a question that can provide support for protecting marriage as a moral good. The answer to this question, incidentally, is well-explained in our current soci-

ety in "The Two-Parent Privilege" written by Kerney³², a social economist, as well as by Pérez Iglesias³³, an evolutionary human physiologist, when comparing the caloric requirements of different types of Hominidae mothers to raise a baby throughout the evolution of these species (and the specific thermodynamic need for both parents to contribute to the caloric intake given our brain size in our species). None of these authors wants to conclude their books with a moral claim. They are not bioethicists. However, their explanation of how we have become what we are and the consequences of not considering it in our current societies cannot be avoided in any further moral theory that aims to be considered realistic. Accepting the "Natural law" is a moral postulate; "Human ecology" should be purely scientific. Human ecology should not be a sufficient condition for any postulate, but its consideration should definitely be a necessary one, as it explains and describes basic facts concerning how it is possible for us to continue our human life on earth, our own survival, which undoubtedly is a moral good.

Natural law perhaps can explain the mystery towards we move but "human ecology" can reveal a little of the previous one, how could we come to what we are now. Another human fact can help us to exemplify this interrelationship between morality and "human ecology", the case of the understanding of the origin and evolution of tenderness and its prevalence in evolved mammals. The evolution of the tenderness through reptiles, birds and mammals in the last 20 million years can help us explain why it can be considered as a human virtue³⁴, although it cannot explain why evolution took this path.

What is clear in any case is that it can help us to be amazed about ourselves, which surely will open us to be more open to reality in our scientific or moral research. We are probably the last animal creature that has appeared in this world, as orchids probably are in

31 Waal, F. de. *Different: What Apes Can Teach Us About Gender*. Traducido al español por Tusquets editors. Barcelona. 2022.

32 Kearney, M.S. *Two-Parent Privilege: How Americans Stopped Getting Married and Started Falling Behind*. The University of Chicago Press, 2023, 240 pp. ISBN: 978-0-226-81778-1.

33 Pérez Iglesias, J.I. *Primates al este del Edén: El organismo humano a la luz de la evolución*. Ed Crítica, 416 pp. Barcelona. 2023. ISBN: 9788491995869.

34 Martínez de Anguita, P. 2023. Op. cit.

the vegetal kingdom. How is it possible that all this evolution has allowed a creature like us to be able to discover such a complex morality in their acts and made our life depend on an evolutionary - reptile, bird, mammal – process of parental communication such as tenderness? How is it possible that this entire universe has tended to make love and tenderness the condition that made possible complex evolutionary success such as the one we share with for example with mammals so far away from us such as whales? The sense of wonder and humility that "Human Ecology" can develop in us when considering our ecology and our bonds with the rest of creation should lead to not only doing theology on our knees as von Balthasar³⁵ claimed, but to help moral researchers to pay more attention to the basic data of reality to discover and build moral theories without escaping from our basic human evolutionary facts. These facts and ecological theories concerning our existence is what "Human ecology" should try to gather into a discipline that should not be avoided by bioethicists.

Authors' contributions

P. Martínez de Anguita conceived the idea, carried out the bibliographic search and prepared the first draft of the manuscript. P. Posada Ayala reviewed the draft and prepared the final version.

Competing of interest

The authors declare that they have no conflict of interest that may have influenced the results obtained or the proposed interpretations.

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³⁵ von Balthasar, H.U. 1948. Theologie und Heiligkeit, Aufsatz von 1948, en: *Verbum Caro*. Schriften zur Theologie I, Einsiedeln 1960, 195-224.

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