RIVISTA INTERNAZIONALE DI FILOSOFIA E PSICOLOGIA
DOI: 10.4453/rifp.2022.0007
ISSN 2039-4667; E-ISSN 2239-2629
Vol. 13 (2022), n. 1, pp. 72-78

TEMI ED EVENTI

Towards an ethoanthropology

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Ricevuto: 27 gennaio 2021; accettato: 24 gennaio 2022

Abstract In this paper, I propose we replace the anthropocentric paradigm with an ethoanthropological one that can account for the fact that the human being is just a part of the world and of "nature". Theoretical reflection and recent findings in the natural sciences confirm that ancient anthropocentric dualisms – the ancient *body/soul*, and *res extensa/res cogitans* divide – are obsolete. Here I argue that the human being is a *bodymind continuum* (an *embodied mind*), comprising *action*, *experience*, *nurture*, and *culture*. To develop a broader and at the same time more specific science of man is possible only on the condition that we give up the anthropocentric view and replace it with an ethoanthropology. This would also provide compelling reasons to forego harmful experimentation and exploitation of other animal species, including animal biotechnology.
KEYWORDS: Anthropology; Biotechnology; Ethology; Nurture; Culture

Riassunto *Per una etoantropologia* – In questo articolo si avanza la proposta di rimpiazzare il paradigma antropocentrico con un paradigma etoantropologico rivolto a ricomprendere dell'essere umano all'interno del mondo e all'interno della "natura". La riflessione teorica e le scienze naturali confermano che l'antico dualismo antropocentrico – l'antico dualismo tra *corpo* e *mente*, tra *res extensa* e *res cogitans* – è semplicemente obsoleto. L'essere umano è un *continuum* di *corpomente* (una *mente incarnata*), *azione*, *esperienza*, *educazione* e *cultura*. Sviluppare una scienza dell'uomo che sia più ampia ed al contempo più precisa è possibile a patto di superare il provincialismo antropocentrico e di sostituirlo con una etnoantropologia. Questa potrebbe fornirci delle ragioni forti per rinunciare alle pratiche più distruttive operate sugli animali, comprese quelle biotecnologiche.
PAROLE CHIAVE: Antropologia; Biotecnologia; Etologia; Educazione; Cultura

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1 Paradigms

THOMAS KUHN'S EPISTEMOLOGY CAN HELP us understand the entrenched resistance of experimental practice to the increasingly numerous and significant data sets that have gradually reduced the hiatus between humans and other animals. After all, anthropocentrism is one of the oldest not only scientific, but also, and above all, cultural, existential, and religious paradigms.

With his sarcastic criticism of any form of anthropocentrism, Xenophanes was among the first to undermine the imaginary truth that humans have origins, needs, and *values* that are entirely irreducible to those of any other species or to natural principle in general. Even the two immediate successors of Aristotle at the helm of Peripatos – Theophrastus and Strato of Lampsacus – moved away from the *Scala naturae* of the Master, maintaining instead the presence of a ψυχή, of mind, in all animals. The paradigm proposed in the Greek world by Xenophanes, Theophrastus, Strato, and Plutarch is the opposite of the biblical one, well evidenced in the words that Yahweh (יְהוָה) addresses to Noah upon leaving the ark: «The fear and dread of you will fall on all the beasts of the earth, and on all the birds in the sky, on every creature that moves along the ground, and on all the fish in the sea; they are given into your hands. Everything that lives and moves about will be food for you».[1]

Yet, since Darwin, those sciences that challenge human centrality and superiority have dominated. The ethological science of Konrad Lorenz and the human ethology of his pupil Irenäus Eibl-Eibesfeldt were based on Darwinian evolution and Kantian epistemology.[2]

To understand the relationship between ethology and anthropology one must start from the fundamental fact that the human being is partly preprogrammed and partly educable. The need for food is natural; the preference for one type of food over another is learned. Sexuality is an instinct; its expression is shaped by culture. The institution of marriage exists among all known peoples, but its forms – monogamous or polygamous, sentimental or political, more private or public – vary across time and space. Beyond its strictly anthropological and ethological context, innatism features in current debates on humanity and the nature of the mind, so much so that it can be said that «nativist theorizing offers the best understanding of our cognitive abilities, and thus of our place in the natural world».[3] The innatist perspective «has also received a powerful impetus from work and evolutionary biology, as biological thinking has begun to permeate psychology and philosophy of mind».[4] While the debate remains open as to which particular cognitive processes are produced by genes, whether in conjunction or independently of experience, evidence that the mind is also guided by innate structures cannot be seriously questioned. But what exactly does *innatism* mean?

> Nativists are inclined to see the mind as the product of a relatively large number of innately specified, relatively complex, domain-specific structures and processes.[5]

Chomskyan linguistics, sociobiology, and human ethology also spring from a common Darwinian terrain in so far as for both Darwin and

> for evolutionary psychologists, the blank slate view is both theoretically implausible (because a blank slate architecture would pointlessly and fatally handicap any animal so designed), and inconsistent with the comparative evidence. Darwin and subsequent evolutionary researcher have investigated numerous species in which organisms display knowledge and competences that they did not acquire ontogenetically from any general-purpose, content-independent neurocomputational procedure.[6]

In any case, *innatism* and *learning* are not in conflict; only their convergence can explain the complexity of human beings and their surprising adaptive capacity:

> The widespread perception of an inherent conflict between innateness and development is illusory. Innateness and development can act together in several ways, and can even act on the very same underlying processes. Innately specified structure can *itself* develop, and there is nothing mysterious about this process.[7]

Innate components and acquired components, learned functions, and biological structures, are not in opposition but instead converge to build and explain the human and its ways of life. It is also a question of overcoming this form of dualism, like all the others. There is no reason to interpret the concept of innate as a synonym of "already present in the brain of a newborn baby". An innate structure, in fact, is such not because it is already necessarily present as a whole from the beginning but because it is the condition for the unfolding of what is to be learned. Environment, education, and epoch are what constitute us, but some innate dispositions are equally decisive.

Human culture is a completely natural element that arises from genetic conditions and environmental learning, as in every other living species. Until very recently it was believed that *Homo sapiens* originated from hominid progenitors passing through the australopithecines, the *Homo habilis*, *erectus*, *sapiens* up to the Neanderthals and Cro-Magnons. Only with the appearance of the latter is

humanity as it is known today supposed to have emerged.

But this theory of linear and reassuring progression, that the sciences cultivated since the first days of genetics (Francis Galton) and paleoanthropology (with the discovery of the first documentation of *Homo neanderthalensis* in 1856), has proved to be completely wrong. Especially since the advent of new genetic methods in 2010, earlier beliefs have been progressively overturned giving way to new, previously unimaginable evidence of hybridization between *Homo sapiens* and *Neanderthals*. We – modern humanity – are a hybrid product of evolution.

The Vitruvian paradigm – anthropocentric, hierarchical, exclusive – continues to reveal its own ideological and unscientific bias, its apparently reassuring non-critical approach. It is simply *the human, too human* expression of a species which presumes that it does not belong to the world that gives it oxygen, strength, nourishment, life, and meaning, i.e., the animal world. An alternative, broader, and more comprehensive paradigm capable of combining the difference between the human being in the world and its identity as an animal within this world is needed: an ethoanthropological paradigm.

2 Ethoanthropology

Both theoretical considerations and the natural sciences advise going beyond ancient anthropocentric dualisms in an attempt to forge an ethoanthropology based on evidence and critical contributions from all branches of knowledge.

If a science of man is possible, in both a broad and precise sense, it must start by overcoming anthropocentric provincialism, the ancient dualism between body and soul, between *res extensa* and *res cogitans*. The profound unity of body and psyche is demonstrated by the daily activity itself, by the psychosomaticity of health and disease, emotions, and logic. Even when information or feelings seem elementary, they are actually immersed in the *continuum* of culture and corporeality. The human being is an embodied mind or "bodymind", *action*, *experience*, *education*, *culture*. I will now try to briefly clarify each of these aspects and their constant and reciprocal interactions.

The *bodymind* is the isotropic structure that allows everyone to position and orient themselves at a specific point in the enigmatic and unrestrainable transformation of matter. No information would be possible without the physical density of the individual. Even feelings are first of all the reaction of the body to other bodies, to events, fears, and perspectives regarding the protection and health of one's organs. Through the *bodymind* we feel with certainty that we belong to the world, we discover our resemblance to every other element of nature. The *bodymind* is the friction without which our being would wander in an incomprehensible void, in nothing. It allows our person to have firm roots, to sink into the energy that makes up the universe. The consumption of the body and its wearing away win the race against time by subtracting it from absurdity, linking it to matter, transforming its individual sunset into the time of the stars, the time of the supernovae, whose formation generated the clouds of electrons and protons that have, in their encounter with the terrestrial environment, produced the genes of all living species. What we call "culture" comes from the *bodymind*, from the need to interact with the other, with the *outside*, while trying to understand how the inside and the outside are possible, the constant dialogue of each individual with itself, and the continuous interaction with that which one is not, that is, with that which is not my body. It is therefore from corporeality that every culture is born.

The *bodymind* is never static: whatever it does, whatever position it takes, it is always *action* and *experience*. Action is technicity germinating from nature. The human being finds its own identity as an animal in the artifice, in the formalization, in the hiatus between impulse and action. The rationality of the human animal is both the cause and consequence of its technical production of forms, that is, of culture. This means that the organic has a social dimension in humans and other animals, and that the societies that some animals have constructed in turn become incomprehensible without a reference to that which for them is the formalization of the biological element. The world of experience is the experience of the world. It is the passionate and uncertain, curious and fearsome, ludic and distressing approach to objects, conspecifics, and nature. The paradoxes of action constitute all the uncertainty of living but make existence interesting. The accumulation of actions produces experience and it is for this reason that, in the end, experiencing coincides with living, that is with gradually learning at one's own expense how complex the world is and how risky the task of protecting the body. This is how, through action, the *bodymind* molds the world and forms itself. Action is the creation of events, the construction of objects, *Bildung*.

The forming of a human being remains an asymptotic task – it cannot be said that it is ever fully accomplished. If this is true, however, we must equally distinguish between the years from childhood to maturity and the subsequent years, the time of *education,* and that of the adult human being. Humans always need friction to grow, but this need is more urgent in the early years of their existence. It is during those years that humans learn the *Qual des Negativen*, the shaping power of pain, suffering, and difficulties. The taboos, prohibitions, and initiation rites that characterize all cultures in different ways are motivated by this primary need:

to prepare the individual for the harshness of life. Education consists primarily of this task.

In light of all this, what are or should be the relationships between ethology and anthropology? Is it legitimate, does it make sense, is it useful to apply some results from the study of animal behavior to the analysis of the human condition? Lorenz's ethology allows us to better understand the cultural structure of the human animal by comparing it to the behavior and organization of other animals. To study the biology of behavior means to analyze its innate components, inherent in the body, while keeping in mind that, in mammals, innate and acquired elements always cooperate to produce one action or another. The concept of "innate" does not imply the immutability of human nature precisely because the ability to learn and therefore adapt to the environment is indeed constitutive of our species.

3 Natureculture

The distinction that the anthropocentric paradigm has made with the terms *nature* and *culture* ignores the fact that these belong to a unitary structure – to such a degree that it is only possible to understand the human if the *biological* roots of individual and collective behaviors are known: we should call this *natureculture*.

At the basis, for example, aggressive behavior reflects adaptive structure, that is, a process that shapes the organism making it well-suited to its environment, ensuring its survival. Biological research confirms that human behavior is the result of phylogenetic adaptation and adaptive modification.[8] In other words, innate components and learned components work together to make the organism safe and active within its specific living environment.

There is no contradiction between the fact that all learning mechanisms are phylogenetically evolved and that they are useful to the unique and diverse experiences of every single organism. The *innate* and the *learned* complement each other but must not be confused with one another. There should be neither conflict nor confusion but an interlocking and a convergence of phylogeny and ontogenesis. So, what is the innate? A Kantian a-priori type, which makes possible the various adaptive modifications beginning with phylogenetically constructed structures.[9]

Why is there the assumption that, among animals, only *homo sapiens* is devoid of some constant characteristics that make it what it is, despite evolution's complexity? Throughout the story of evolution, the human primate took on quite specific characteristics, those that go under the name of cultural traditions. Yet it did not move away – and how could it? – from its biological matrix, from its animal structure.

Ethoantropology can represent a form of «hermeneutics of otherness»,[10] contributing to an awareness of the limitations of the species, an antidote to approaches which end in destructive actions towards humans and the planet. In fact, ethoanthropology teaches that the innate and the learned, the biological and the cultural, are distinct but can collaborate in producing more rational and adaptive behaviors. That an impulse is innate does not mean that it cannot be educated. Just think of sexuality: it is a primary instinct, but no one would choose to reduce it to its most violent and disordered expression just because it is certainly innate. Likewise, aggression can be controlled and redirected towards harmless targets, but there is no denying that it is an innate device in a mammal that needs to explore, feed, defend, and mate.[11] That which is *phylogenetically adapted* is innate.

Knowing our limits is one of the foundations of ethoanthropology. An ancient and constant foundation, shared by Platonism, Gnosticism, and Spinoza: «Man is such a member, and is by his reason called to fit consciously into the whole; but his is by no means the highest mode of being, he is not the end of nature, and the cosmos is not for his sake»;[12] «Sed dum quæsiverunt ostendere, naturam nihil frustra (hoc est, quod in usum hominum non sit) agere, nihil aliud videntur ostendisse, quam naturam. Deosque æque, ac homines, delirare. Vide, quæso, quo res tandem evasit!».[13] Human presumptuousness in considering our species the purpose of existence thus appears completely unscientific. The full scope of the excess of our ambitions is manifested become clear once we raise our gaze above the narrow horizon of our planet. Our uniqueness and dignity in the universe are revealed, then, for what they are: an insignificant drop of life in the eternal and aimless spinning of the galaxies.

It is time to put an end to this anthropocentric excess, to the childish claim that the world was made for the exclusive use of one species, that the turning of galaxies and matter is aimed at the progress of human affairs. Our species is not the apex, the goal, and the sense of all that is; it does not constitute the secret intention towards which matter tends, and it certainly does not represent the culmination of the biological story on planet Earth.

Human sciences and natural sciences are therefore not two separate fields but two branches of a single knowledge, to be learned in its multifaceted unity. The complexity of the world is incomprehensible without a vision capable of synthesizing *science* and *humanities*. Indeed, «the central idea of the consilience world view is that all tangible phenomena, from the birth of stars to the workings of social institutions, are based on material processes that are ultimately reducible, however long and tortuous the sequences, to the laws of physics».[14]

Understanding the human condition means first of all understanding genes and culture – not as autonomous environments and functions but in their essential coevolution, as *natureculture*. The evolution of the brain and that of behavior have proceeded together for millions of years, each within the framework of the laws set by natural selection. The root of many of the dangers that dominate Earth and humanity lies precisely in the fact that, since the Neolithic Revolution, cultural evolution has become incomparably faster than genetic evolution. However, still today

> *culture is created by the communal mind, and each mind in turn is the product of the genetically structured human brain. Genes and culture are therefore inseverably linked. But the linkage is flexible, to a degree still mostly unmeasured. The linkage is also tortuous: Genes prescribe epigenetic rules, which are the neural pathways and regularities in cognitive development by which the individual mind assembles itself. The mind grows from birth to death by absorbing parts of the existing culture available to it, with selections guided through epigenetic rules inherited by the individual brain.*[15]

Each organism, including the human organism, develops under the impetus of heredity and the environment. *Homo sapiens* is in fact a species belonging to the order of primates whose identity, both genetic and cultural, is given by epigenetic rules, by hereditary regularities. There is nothing fatalistic in such a vision, which does not claim that the specific forms of culture, the values of a population, and its beliefs, are dictated by genes. Rather, it supports the inseparability of genetics and culture in the complexity of the adaptive behaviors of the human animal.

What we call culture appears, of course, as the element that characterizes our species with respect to others, but it is also the most recent product of the genetic history of humanity. To the naive dominant anthropocentrism of the social and human sciences, we must oppose the materialistic fact that «our species and its ways of thinking are a product of evolution, not the purpose of evolution».[16]

The universe was certainly not made to measure for a species living on a small planet on the outskirts of the Milky Way. Rather than believing ourselves to be masters of the Earth, it would be better to show ourselves respectful of the myriad forms of life with which we live and on which our survival depends.

4 Animal experimentation

What has long been called "vivisection" is now part of a set of practices that can be grouped under the common definition of "animal experimentation". Despite the differences in modality and objectives, these remain destructive methods for exploiting our relationship to animal alterity, methods that are far from meeting contemporary scientific standards.

This must be said clearly, despite the immediate, instinctive, almost Pavlovian accusation that is triggered against anyone who questions, even with calm and plausible arguments, the statute of a practice that responds much more to criteria of economic profit and academic budget than to scientific criteria. It is a profitable practice, especially for pharmaceutical companies but not for human health. In the scientific community, awareness is spreading that animal models only give clues but never certainties. It is often the case that laboratories that carry out the same experiment obtain very different results for no apparent reason.

This methodological error is even more substantial if we consider that – since it makes no sense to study the human within the narrow limits of laboratory settings that widely differ from the world-environment in which humans exist – it is also completely misleading and scientifically wrong to study other animals in the laboratory instead of in the environment in which and for which they evolved and with which they constitute one thing. For example, in the context of studies on sleep in other animals, methodological and behavioral nonsense occurs. For example, experimental methods to prevent mice from sleeping constitute real psychological vivisection: the animals die after a few days. We conclude that sleep is essential for survival. Are such sadistic and completely useless "experiments" necessary to confirm this result, which has been proven many times over?

Beyond practices like these, which are clearly meaningless, there is the fundamental question of timing in the administration of therapies. Indeed, the importance of chronobiology in drug toxicity tests cannot be ignored. Rats and mice are nocturnal animals while humans are diurnal. This difference greatly affects clinical results, which are interpreted without considering the deep and constitutive relationship between the *bodymind* and the environment, between the "internal day" and "external day" within the *temporal*, *plural*, and *differentiated* structure of bodies: «it is becoming clear that although there may be a central clock in some species, in most species time is distributed throughout the organism».[17] Biological clocks are in fact regulated by the fundamental rhythm of light, sunrise, and sunset.

The scientific futility of animal experimentation has been ascertained by hundreds of studies. The risk it poses to human health is high. The case of thalidomide is perhaps the best-known case, but it is certainly not the only one. After having been tested on non-human animals for three years, this drug was deemed entirely safe. However, in the 1950s and '60s, women treated with thalidomide gave birth to

infants suffering from serious amelic and phocomelic alterations, i.e., without limbs or with very short limbs.

These empirical consequences are accompanied by the logical contradiction of those who claim that we cannot apply the criteria for human suffering to other animals but who then postulate a biological continuity between these other species and our own to justify vivisection. This particular error is based on a more general logical error implicit in the very concept of animality. Animality is not a category. As opposed to humanity, it simply does not exist. It is completely incorrect to group together, for example, ants, crows, and chimpanzees by contrasting them with the human species. Many animals are much closer, both genetically and functionally, to the human species than to others. A bonobo or a dog is much more similar to *Homo sapiens* than to bees, mollusks, or snakes.

The animal is not the dark side, a deforming mirror of the human, and neither does it represent the golden age of our species. Life is expressed in a multiplicity of forms all related to and distinct from one another. It is for this reason also that the comparatist obsession with *animal* intelligence as a unitary category that is always and only compared with human intelligence does not make sense – as if the latter constituted the absolute criterion, the benchmark against which to measure any other cognitive ability.

Greater awareness of continuity within the differences between our species and the others would help put an end to millennia of anthropocentric error and centuries of extermination of other animals in the name of human interests. Disciplines such as paleoanthropology, ethology, paleogenetics, and ecology led to an ever deeper rethinking of the unacceptability of the pain inflicted on other species in the name of the superiority of the human one. Conviction and sentiment – the latter, far from being based on objective data – simply arise from the law of the fittest: other animals cannot defend themselves; their living, suffering, and dying depend on the absolute power of humans.

Even if vivisection served *Homo sapiens* (which it does not), its practice is still only a form of speciesism, an ideological position analogous to sexism and racism. There is no absolute superiority in the world. There are only differences. One of the peculiarities of the human is knowing this, one of its limitations is forgetting it.

Other animals are different from humans in the way that tigers are different from the rest of the animal world, including humans. And so are lizards and cats and bees. Each species is different from the whole but only in so far as it is as a section of a totality in which all animals partake. To believe that the human species has any primacy is completely meaningless from both a biological and logical point of view. Each species has particular characteristics, peculiarities, structures, and functions. Anthropocentrism is clearly a mistake. This is widely demonstrated by all the natural sciences. However, the error is still widely practiced, also and perhaps above all for religious reasons, even if expressed in ways that claim to be scientific.

Bees, elephants, cowbirds, and dolphins have specific and respectively diverse cognitive abilities since such abilities are aimed at life and survival in different environments. Reducing this wealth of matter and nature to the usual and obsessive comparison with the characteristics of a very specific species – the human one – is an effort devoid of scientific meaning.

Animal experimentation, therefore, reveals itself as one of the most evident expressions of what Eugenio Mazzarella defines as the "artificialist fallacy", more worrisome than the naturalist fallacy denounced by Hume: A fallacy that consists in deducing "what one must do from what one can do" and which, «in the name of the possibilities of artifice, seems to live increasingly on the opposition between the principle of nature and culture»,[18] as if the human were not also βίος and ζωή, and not only autopoiesis and knowledge. To clearly affirm the inseparable unity of nature and culture, «the biosocial grafting of culture *into* nature»,[19] is the basic thesis of the ethoanthropological perspective.

Therefore, on the subject of animal experimentation and the relationship between the human species and other forms of life – in particular on questions such as environment contamination or the waste and exhaustion of all kinds of natural resources – there are two contrasting theses: one put forward by those who refuse to put any limit to the most useless and destructive procedures, even at the cost of pushing the planet and its inhabitants towards decline and death; another by those who believe that every action, protocol, and research paradigm provide the best scientific results only if placed within a holistic framework that does not fall into the fragmentation of the artificialist fallacy.

5 Biotechnology

The extreme frontier of animal experimentation has a more neutral and disturbing denomination: *biotechnologies*. These are dissipative structures deeply consonant with the most irrational forms of contemporary liberalism. Biotechnology simply constitutes a disintegration of animality since it deals with changes that do not transform but dissolve the animal both in its empirical manifestations and in its ontological meaning. Genetically modified animals, in fact, suffer from multiple diseases, congenital deformities, and serious impairments.

All animals, including humans, have their own way of being in the world, their own ethological specificities, their own perceptual structure, and

spacetime situation. In a word, its own *Umwelt*, the spacetime that every conscious living entity does not just inhabit but *is*. These are all elements that biotechnologies cancel by imposing completely artificial spatial structures and temporal rhythms on animal life and on the individual living entity that are extraneous to the ethological specificity of the individual and the species.

Depriving the animal of time means depriving it of everything, imprisoning it in a present that is pure agony, and forcing it into a temporal block devoid of everything that gives animal life its meaning and justification: predatory and defensive movements, the horizon of waiting, the immersion in a given environment.

Even those who take a posthuman, if not outright animal rights, perspective, those who consider biotechnology favorably because they are enemies of *essentialism* – a true obsession for a lot of *progressive* environmentalists – are not aware of what they are saying. They do not realize that defending the essence of entities – always dynamic, of course, like everything that exists – means safeguarding entities from arbitrary manipulation and opportunistic destruction.

Biotechnologies based on the market of life claim that being in the world is a collection of details. Phenomenological and ethological holism believes instead that every single sensation, painful or pleasant, has meaning and function only within an overall relational and adaptive structure where its chemical, perceptual, and neurological aspects are tightly intertwined.

In synthesis, the biotechnologies that reduce animality to a patentable invention are an extermination practice representing the worst moment in the relation between the human animal and other animals. Perhaps the time has come for all sciences to go beyond the anthropocentric paradigm that unites creationism and technophilia, religions and scientisms, and turn towards a broader ethoanthropological paradigm. Ethoanthropology involves an awareness that the resources of the Earth are limited and that all its inhabitants can cultivate profound relationships with each other – as individuals, as a society, and as a species.

Notes

[1] *Genesis*, 9, 2-3.
[2] Cf. K. LORENZ, *Die Rückseite des Spiegels*.
[3] T. SIMPSON, P. CARRUTHERS, S. LAURENCE, S. STICH, *Introduction. Nativism, Past and Present*, p. 15.
[4] *Ibid*., p. 3.
[5] *Ibid*., p. 5.
[6] J. TOOBY, L. COSMIDES, H.C. BARRETT, *Resolving the debate on innate ideas*, pp. 309-310.
[7] B.J. SCHOLL, *Innateness and (bayesian) visual perception*, pp. 51-52.
[8] Cf. K. LORENZ, *Evolution and modification of behavior*.
[9] Cf. K. LORENZ, *Die Rückseite des Spiegels*.
[10] R. MARCHESINI, *Post-human. Verso nuovi modelli di esistenza*, p. 515.
[11] Cf. I. EIBL-EIBESFELDT, *Der Mensch – das riskierte Wesen*.
[12] H. JONAS, *The gnostic religion*, p. 260.
[13] B. SPINOZA, *Ethica ordine geometrico demonstrata*, *Pars Prima*, *Appendix*.
[14] E.O. WILSON, *Consilience*, p. 291.
[15] *Ibid*., p. 138 - italics in the original.
[16] *Ibid*., p. 34.
[17] R. FOSTER, L. KREITZMAN, *The rhythms of life*, p. 6.
[18] E. MAZZARELLA, *L'uomo che deve rimanere*, pp. 11 and 25.
[19] *Ibid.*, p. 10.

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