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Biacentrism (reduction of human behaviour to the resultant of biological models) has recently gained increasing interest and approval, since it is regarded as the only scientific and hence wholly rational way of under-standing man and his relationships with the environment, and founding an ethics not based on myth. There is thus an assumed or stated need to reduce ethics, aesthetics, politics and religions to paradigms of reference for history (evolution) and the interactions that maintain the equilibrium of the bio-sphere (ecology and ethology). Ethics and bioethics share a common identity. The Gaia paradigm and the Neo-Darwinian paradigm, the two biological paradigms currently most in favour, lend themselves equally well to the justification of biocentrism.

The Gaia paradigm regards the Earth as a complex living system capable of self-adjustment, yet exposed to the risk of collapse or profound changes mainly due to man's impact on the environment. It gives preference to the synchronic ecological approach and introduces the concepts of non-linear response, regularity, order and finalism (the system maintains its equilibrium and repairs the damage it sustains). There can thus be no hierarchical differences between organisms, man included, as all are indispensable to this equilibrium.

The Neo-Darwinian paradigm accords preference to the diachronic approach to evolution and introduces as its causes chance and selection of new forms through the struggle for existence. Finalism is abolished, but a hierachy is retained, since the most evolved forms are heading in the "direction" of evolution, whereas the least fit are eliminated by competition.

The two paradigms are in conflict, though united by their insufficiency as the basis of an ethic. Both, in fact, can with equally logical consistency be used in support of widely differing and conflicting religious, ethical and political and socioeconomic models.In other words, the biocentric paradigms, despite the great confidence reposed in them, do not allow a rational choice to be made between the ethical and sociopolitical models proposed by the so-called human sciences, nor do they provide a base for the construction of new models.

KEY WORDS: *Gaia, Ecological Microbe, Symbiotic Paradigm, Biocentrism, Zoologism*

1. Gaia paradigm is biocentric

The paradigm of the biosphere (the entirety of the planet's living organisms and the substrate on which they are established) as a coordinated, complex and self-regulated structure or a complex, dynamic system was proposed some years ago by Verdanskij (1926, 1944), formalized not so very long ago by Lovelock (1979), and has since shown itself to be a concrete and to my mind significant influence in humanistic culture as well as biology.

All the implications of the most developed form of the paradigm, known as the Gaia theory, a term drawn from the name of the Greek divinity Gaia, the Earth, are discussed in Lovelock's text, while many subsequent publications (reviewed in Galleni 1995) have been inspired by the Gaia model. It is interesting to note that in the Gaia paradigm, which strictly speaking is more a model than a theory, a chemist "on loan" to geology logically elaborated an approach to biology that has much in common with Croizat's panbiogeography (1962) and Teilhard de Chardin's geobiology (1955). How far this paradigm, which not only bears the mark of a geologist and hence is potentially suspect in the eyes of the biological establishment (as are the works of all outsiders in the eyes of all establishments), but also recycles the thinking of Verdanskij and what is more Croizat and Teilhard de Chardin, two irregulars in the ranks of orthodox biologists, can be viewed as a "scientific revolution" *sensu* Kuhn is a question that cannot be discussed here. The definition of the term "scientific revolution", in fact, and particularly that of such a revolution in the life sciences is the subject of debate and would require an extensive discussion (see e.g. Cimino & Fantini 1995) outside the aims of this paper.

Gaia is in any event compatible with the possibility of a catastrophic change of biological landscape (see e.g. Cuvier 1805) and/or of an evolution of evolution (in other words, the catastrophic changing of laws as opposed to uniformitarianism), and hence contributes to the renewed interest in the philosophy of science (Sarà 1994). Furthermore, as we shall see, a certain number of philosophical, economic and political attitudes refer, whether consciously or unconsciously, to the vision of the earth and life described in Gaia (see Chebanov 1994; Krassilov 1994; AA.VV. 1995). It has thus seemed to me of a certain interest to advance some thoughts on the paradigm, compare it with the Neo-Darwinian paradigm and inquire into their consequences outside the realm of biology. And if we accept biocentrism, in its most explicit form as "reduction of all philosophical, economic and political reality to biological paradigms", the human sciences would seem to lose their *raison d'être,* or transform themselves into a chapter of biology (for an initial approach to biocentrism, see Oleskin 1994).

2. Gaia paradigm is synchronic paradigm

If we confine ourselves to its biological aspects, the first consequence of the Gaia paradigm is the centrality of the synchronic ecological thesis rather than the classic diachronic thesis preferred by traditional evolutionistic theories.

While Gaia formalises life as a dynamic megastructure that not only evolves but governs itself in accordance with precise rules, the diachronic thesis as expressed both by Lamarckism and in Neo-Darwinian synthetic theory formalises life as the history of its course on the Earth (see e.g. Luzzatto *et al.* 1995). If we accept Gaia, therefore, evolutionistic biology becomes a reductionistic (change of structures in function of time) aspect or, better, way of understanding a system endowed with strict coherences and regularities that lead to stable, ordered interactions between its subsystems in both time and space.

It is good to remember here that by convention the term "symbiosis" is assigned to stable, ordered interactions between bio-logical subsystems. As defined by De Bary [1879], this term is neutral and implies no indication that it is an advantage or a disadvantage. Acceptance of Gaia, therefore, means acceptance of the centrality of symbiotic phenomena in the biosphere.

The scheme of Gaia thus appears as a global modelling of living things. It is proving of great significance for a new, holistic approach to biology (Sarà 1994), since a complex, self-regulating system presupposes, in addition to the existence of ordered structures, the possibility of non-linear responses. In a word, to quote a well-known aphorism: "The beating of a butterfly's wings in London may unleash a typhoon in Insulindia".

In this context, the reductionist (i.e. at the molecular level) approach to reconstruction and assessment of the synchronic dynamic equilibrium of the biosphere (ecology) becomes experimentally impossible and conceptually insufficient.

A more consistent model can only be obtained by postulating the molecular level as a component that does not exhaust the complexity and order of the higher levels, and accepting the possibility that the order of biological systems can increase by leaps and bounds following the appearance of emerging properties. In other words, the model is plausible whenever the genetic information does not exhaust all the information and co-information of the biological systems (cells, organs, organisms, populations).

This is obviously opposed to the classic treatment, which pre-supposes biological forms to be in bi-univocal correspondence with both genes and the selection imposed by the environment (Neo-Darwinism). By contrast, the Gaia model is perfectly accept-able for those paradigms that presuppose the existence of systems that construct co-information, as in the semantic theory (Barbieri 1987), or negentropy through acquisition of emerging properties as the outcome of endogenous, non-genetic constraints (Lima de Faria 1988), or through interactions between subsystems (symbiogenetic theories of the Bellagio group, see Margulis & Fester 1991), or through the existence of surrounding conditions proper to the biological structures (where "structure" = the shape, arrangement

and variety of objects in a set at a given time) that control and differentiate the expression of genomes widely common to different species (Sibatani 1998).

Gaia, in other words, is nothing other than one of the statements of the systems theory of von Bertalanffy (1968), which pre-supposes discontinuous variations of complexity at various organization levels (emerging properties), so that to maintain the system in equilibrium interactions must not only occur "in the right way", but also "at the right time" in accordance with a precise order. Experimental illustrations of the plausibility of the Gaia paradigm can be gleaned from many data on closed systems, such as the *in vitro* systems, microcosms and mesocosms used to check the interaction of microorganisms in mixed cultures (see e.g. Varese *et al.* 1997), as well as recent field data demonstrating the regulation of soil prokaryote populations by plant-fungus symbiosis (Barea *et al.* 1998).

3. The ecological microbe

A particularly convincing demonstration of this plausibility in the natural environment is provided by the results of experiments in medical microbiology, and by the theoretical formalization of microbe ecology reviewed according to Sonea's model [19,93], which regards the prokaryotic world as a system of free gene" ex-change. This is a recent notion. Bacteria, in fact, were long studied in terms of application, mainly within the compass of medical microbiology, and very little attention was paid to their ecology and natural lifestyle. To make matters worse, bacteriology was plagued for many years by a systematic diatribe between those who spoke of sharply distinct species of bacteria and those who believed in their total plasticity. This difference of opinion, of course, sprang from the clash between the "fixity" of bacterial species (the existence of true species) and pleiomorphism (the existence of a single, plastic species). It is equally true that the victory of "fixity" has led to the maximum development of medical microbiology, and that pleiomorphism was a mistaken interpretation. Even so, it cannot be denied that this victory has concentrated attention on pure cultures of individual species and ignored the complexity of bacteria populations in nature.

Investigation of natural mixed prokaryote populations, how-ever, readily shows that:

1. they share complementary metabolic capabilities;
2. each of their cells has a particular ability to transfer and receive segments of genomic information in the form of small auto-transferable or non-autotransferable replicons;
3. they form part of a global information exchange system based on collaboration of single units to the advantage of the megaorganism.

The lifestyle of bacteria can be appropriately presented as a mutualistic symbiosis without speciation, that is to say as a form of global collaboration, at all events in the Archaeozoic and part of the Proterozoic periods, in which bacterial populations colonized all the existing ecological niches, and is still maintained today, albeit corrected by competition.

In other words, Sonea (1993) regards the prokaryotes as the most consistent manifestation of the Gaia model, since they are the highest expression of autoregulation of a complex system by means of mutualism, and contrasts them with the prevalently competitive eukaryotes — "anarchical individualists." To state the matter in the simplest terms, this is equivalent to saying that Gaia is maintained through an equilibrium between the predominance of mutualism (collaboration with reciprocal advantage) among the prokaryotes and the predominance of competition (selection) among the eukaryotes.

At this point, one can legitimately examine the relationships between the Gaia paradigm and the current evolutionistic and structuralistic biological paradigms, and the constraints imposed by the interactions between mutualism or competition and this equilibrium.

To do this, we must establish a minimum constitutive unit of the entire Gaia endowed with the properties of a "living structure" and a "system in symbiosis" so as to define the minimum sub-set endowed with all the properties of the megastructure, and so check the plausibility of a dynamic system dependent on symbiotic integrations.

Acceptance of this idea is not automatic. It is the point of view of Richmond & Smith (1979), who regard the eukaryote cell as a habitat, a global target for selection. Equally valid, however, is the alternative of Maynard-Smith (in e.g. Margulis & Fester [1991]), namely that the genome is a selection unit. A currently accepted definition valid for all living structures, in fact, is *"a system endowed with processes capable of determining its duplication in any form, and with the power to undergo 'mutation'. The first of these properties allows the formation of further generations of the living being, while mutation enables it to evolve in response to the pressure of its natural environment"* (Cavallo 1994).

This definition is the simplest and most consistent expression of a Neo-Darwinian, evolutionistic and pan-selectionistic paradigm valid for the whole of the biosphere, from viruses to man.

Any aporias between Gaia and Neo-Darwinism should be immediately made apparent by a comparative analysis of the data on which the Darwinian model is based and the implications and data of the Gaia paradigm discussed above.

4. Diachronic paradigm as evolutionistic paradigm

Diachronic paradigms are those most familiar to biologists and the public at large. They can thus be recalled schematically through a presentation of their salient points.

Palaeontology has shown that the structures of living things have changed in the course of time. The earliest forms of life appeared some four billion years ago. Since then, genera, classes and orders of inter-related creatures have become extinct and other living organisms have appeared to take their place.

The most outstanding example of extinction is that which took place more than 2 billion years ago during the Proterozoic, when most of the anaerobic bacteria capable of living in an atmosphere devoid of oxygen made way for aerobic, oxygen-producing and oxygen-consuming forms.

It is clear, therefore, that the enormous variety of living things relates not only to their present entirety or biosphere, but to the continual replacement of older by different and more recent forms.

If we agree that ancient species, including those now extinct, may be the ancestors of present species, and good reasons for doing so are provided by comparison of the DNA of recent species, the key to understanding living things is reconstruction of their origin as a family history, in other words recognition of their ancestors and reconstruction of the mechanism that has led to "change", to new forms and their selection. Here the Neo-Darwinian paradigm diverges from that which is best adapted to the Gaia paradigm, namely the symbiotic or symbiogenetic paradigm with its by no means negligible trace of classic Lamarckism (see Lamarck 1809).

Evolution is traditionally associated with the acquisition of new forms through "small changes in the genome". The principle of natural selection and the survival of the fittest is the key to under-standing the biological multiformity envisaged by Charles Darwin and his followers (Darwin 1859).

The success of this key since the 1940s has been such as to make it the orthodox key to the interpretation of theoretical biology.

This paradigm comprises the laws of probability that "fabricate" the new biological forms destined to establish themselves successfully. Countless random mutations over the course of mil-lions of years have passed through the filter that "selects" the fit-test. Natural selection proceeds by tiny steps in the construction of new biological forms.

This pattern reflects the application of combinatorial theory to biological evolution and has recently been the subject of well-founded epistemological criticism (Morchio [1992]). It is, how-ever, an obviously powerful and convenient tool for interpretation since:

1. It uses principles common to all the natural sciences, especially uniformitarianism, which states that today's phenomena are no different to those of prior geological ages.
2. It introduces combinatorial theory as a general mechanism to explain both mac-

roevolution (establishment of the fittest within a given species) and macroevolution (the establishment of new levels of organisation that are concretely expressed in the appearance of divisions and phyla).

3. It frees the mechanism of biological evolution from any suggestion that it is governed by a purpose or the attainment of an end.

Chance creates new forms. It is the needs of the environment that lead to their selection and are thus the sole, unseeing motors of evolution (Monod 1970).

Uniformitarianism, mutation, selection and evolution in small steps can be applied at all levels of complexity: from cells (prokaryotes increase in complexity to become the compartments of eukaryotes), to organisms (individuals mutate to the point where they can no longer be crossed with their progenitors), and populations (species establish themselves, or are destroyed in the struggle for survival against their environment and other species).

If these premises are accepted:

1. all the complexity of higher levels of organization is merely the sum of the complexities of the lower levels, from atoms to galaxies;
2. both diachronic and synchronic phenomena depend on chance alone;
3. the Gaia paradigm is incompatible with Neo-Darwinism, or at least requires that the Neo-Darwinian model be substantially corrected.

5. The symbiotic paradigm

This paradigm sprang from the observation that symbiosis, i.e. long cohabitation with a blending of both structure and metabolic capabilities, is both extremely widespread to the point of being almost a general rule in some major groups of organisms, and frequently apparent as a form of collaboration (see e.g. the data and paradigms discussed in Margulis & Fester 1991).

Some 95% of all plant species, for example, form mutualistic symbioses with fungi (Scannerini 1994). Cyanobacteria and algae, too, combine with more than 20,000 fungus species to form lichens. These symbionts, indeed, are so closely integrated that they are treated as organisms in their own right. In the animal kingdom, symbiosis is more frequent than is generally supposed (see Nardon 1992). Mutualistic symbioses are established by many insects. The rice weevil, for instance, has a specialized organ to house intracellular bacteria that improve its metabolism and control its sex ratio. In more extreme environments, such as the ocean trenches with their warm upsurges, gutless abyssal sea worms survive because their cells shelter bacteria that exploit these sources of hydrogen sulphide to fabricate organic food for their host. In the forms we have described, an ordered cycle of two-way exchanges prevails over competition between the components of the association, though only those that provide the right signal at the right time partici-

pate in the benefits of the interaction. This also involves the exclusion and elimination of forms that are "not recognisable" or "recognisable as potentially extraneous to the chain". Competition and pathogenesis, therefore, are simply the possible "rear face" (Lorenz's "Rueckseite") of the mirror of symbiosis.

In a symbiotic paradigm, evolutionary "novelty" mainly stems from:

1. insertion of an organism in a favourable hypercycle as the result of congruity with its own constraints and those of its counterparts. Mixed bacterial cultures in the natural environment (Sonea (1992)) and mycorrhizal symbioses (Smith & Read (1998) are the proof of this hypothesis;

2. acquisition of new symbioses, in other words new formations whose origin is different from that of their host.

The lichens substantiate this hypothesis, as do the luminous organs of abyssal fish, which develop due to the presence of inheritable luminescent bacteria and are the key to the evolution of entire orders of fishes (Margulis & Fester 1991).

1. Last but not least, consideration of all the influences symbiosis has exerted on cell evolution (Scannerini 1995, 1996) and elaboration of the symbiotic paradigm in ecological terms show that: it imposes a constraint that is in opposition to the Neo-Darwinian paradigm, since it is only compatible with evolution by leaps and bounds;

2. it corrects the random, pan-selectionistic paradigm by inserting the order of the interaction as both a synchronic and a diachronic controlling factor;

3. it is perfectly compatible with the Gaia paradigm.

6. The biocentric man

As can be seen, both kinds of paradigm are global in the sense that they comprise life on the Earth in all its manifestations. There is no reason why they cannot be extended to human beings and their behaviour. Human ethology is the logical result of these paradigms and results in ethical assessments of such behaviour (see e.g. Lorenz 1973).

Yet biocentrism, i.e. the reduction of man and all his manifestations to the biological paradigms is not new. It has already appeared in a variety of forms in the 20th century.

In all the paradigms that are strictly biocentric *sensu Kuul* & Tiivel (1988), the anthropological reference model, in philosophical terms, depends on the biological paradigm initially chosen 'as the only one that is valid.

Examples of a biocentric interpretation of man mediated by a general reference system that is uniformitarian (no discontinuity between man and other animals), reductionistic (differences between systems are the result of small variations, and hence those between closely related biological systems are almost imperceptible), and selectionistic (the least fit is eliminated owing to its inappropriateness to the environment) are numerous. They hark back to either Darwin's view of life governed by chance, or Lysenko's notion of the absence of internal constraints in biological forms and the inconsistency

of human beings as such (a blank sheet to be covered with the writings of the environment).

For the sake of simplicity, we can say that the most frequent and lasting biocentric *(genecentric)* extrapolations go back to Darwinism. At the beginning of the century, the idea of the survival of the fittest prevailed and gave rise to the expansionist and race-oriented social Darwinism of the British Empire. In parallel, it served (and still serves) as the backbone of free trade. The market and unrestrained competition, in fact, were assigned the task of selecting the fittest producers and regulating both the economy and society as a whole. Paradoxically, however, German National Socialism, a biocentric model firmly based on the supremacy of a particular race, regarded Darwinism as incompatible with its ideology and refused to have anything to do with it.

More consistently, Soviet Communism and its sympathisers, once the decks had been cleared of Lysenkism as the justification of the elimination of those who set their faces against the "healthy and saving" environment of class dictatorship, accepted Neo-Darwinism in the 1960s as a selectionistic principle applicable to the social classes and as a justification of the dictatorship of the proletariat, since it was in keeping with the "direction of evolution". Neo-Darwinism today is equally at home with behaviourism (the environment as a "central directive agency" of adaptationism) and (more consistently) with sociobiology (the egoist genome as the omega point of biology and philosophy). In these contexts, cognitive mechanisms are seen as a process that can be reduced to the selection of neurons and their connections within the brain in response to changes in the environment (see Fasolo [1998] and references quoted therein). It can, of course, be just as consistently claimed that neuronal Darwinism is one of Nature's cunning ways of securing the supremacy of the egoist genome that codes the neurons.

Furthermore, that the Neo-Darwinian schema can be viewed as a tool of evolution ("chrce is God's other name") aimed at an omega point (God) that is also the cause of evolution, is suggested by the evolutionistic model of Teilhard de Chardin (1955). De-spite a barrage of philosophical and theological criticism, indeed, for example on the part of Frenaud *et al.* [1963], Teilhardism has been received into orthodox Catholic thought.

7. Controversial impacts of Gaia

The effects of the Gaia paradigm, too, have been felt outside biology. It influences the human sciences and can put itself for-ward as a biocentric *(geocentric)* paradigm. This, indeed, with divergences potentially still wider than those of the Darwinian model, since it is fully compatible with the holistic paradigm and with an organistic, antimaterialistic and antireductionistic vision such as that of Whitehead's philosophy (1929).

Through a sort of paradoxical effect, Gaia can thus be proposed as a biocentric-geocentric paradigm that goes beyond biocentrism in the name of multiplicity and collaboration between cultures and the recovery of the mythical component.

It is not a secret that the environmentalist movements owe much to both Lorenz (1973) and the Gaia paradigm (for a socio-political approach to the bibliography of ecologism, see AA.VV. (1995). Yet even in this narrow sector, the Gaia paradigm, like all the bio-logical paradigms, can indifferently serve as the support for completely alternative paths. From it, in fact, one can deduce Neo-Luddism (profound ecology) opposed to the currently dominant socio-economic model in both the open market economies and the remaining Communist or post-Communist governments (Nees 1989), harmonisation between economics, new technologies and the safeguarding of cultural and technological diversity in the global village, as in the ecovillages experiment (global village network: http://www.gaia.org), and the use of biotechnologies "to govern evolution" (Truett Anderson (1987). It should be noted that the harmonisation model can be assimilated *a posteriori* to nonbiocentric models, such as the social doctrine of the Catholic Church and the theoretical paradigm of Italian Fascist corporativism, the proponent of dynamic modernity-tradition equilibrium and a market economy corrected by political interventions.

Lastly, the fact that the Gaia paradigm has intersections with philosophical-religious positions ranging from Buddhism to the New Age movement and some aspects of Catholicism (from Franciscanism to Teilhard de Chardin's religious evolutionism), and is perceived as such by many of those who approach it, offers further confirmation of the heterogeneity of the religious, philosophical and socio-political positions for which an extrapolated biological paradigm can act as a support.

8. Biocentrism and zoologism

Biocentrism, in short, is becoming increasingly pressing, but takes concrete form in a paradox: the same biological paradigm is used to back conflicting ideologies and practices. The influences of Darwinism on divergent ideologies referred to earlier (or its use as the support for diverging ideologies?) are enlightening from this point of view. Yet this is equally true for the fundamentally holistic and Lamarckian Gaia paradigm with all its reflections on both philosophy and socio-political or religious interpretations.

In one of his last interviews, Ernest Juenger declined to answer questions about the future of mankind and its societies on the grounds that this is a subject that will increasingly become "the business of the zoologists". This was certainly not intended as a compliment, since Juenger regarded man as a being that must accept and overcome as initiatory tests the experiences he is faced with (see e.g. Juenger 1960). There can be no doubt, however, that his words reflect the way things are today at a time when ethology and biology present themselves as a global benchmark for understanding mankind. Biocentrism is thus becoming increasingly cogent insofar as a bioethics is developing, mainly as an answer to biotechnologies and ecological issues, and seems to put it-self forward as strictly dependent on biological paradigms.

In merely egoistic terms, we must ask ourselves as human beings whether this can be a winning choice and the only foundation for ethics. In terms of practical reasoning, one would not say that a biocentric choice is for the safeguarding of man.

One must not forget, in fact, that the law of every man for himself prevails in Neo-Darwinian theories, and there is no justification for imposing rules other than that of the fittest or strongest. Moreover, in symbiotic theories and the Gaia paradigm, the biosphere is understood as a balance between organisms of equal dignity and significance for the subsistence of the terrestrial super- organism. Yet if there are no differences between man and other living organisms, due to the equivalence of all the components of the biosphere as an integrated cybernetic system, one cannot de-duce that the life of a human being may be worth more than that of a bacterium.

Furthermore, self-regulated symbiotic interaction is not "leaf green" mutualism, but the sum of blood-red competition and mutualism: the action that destroys him who is not enlightened, namely the outsider who is not in the right place at the right moment of the ritual, saves the enlightened one. And there is not much sense in sophisticating over which species each of them be-longs to.

The strong message of Neo-Darwinian biocentric-genecentric paradigm therefore, is the centrality of chance and the loss of any reference to laws and regularity of the human condition. By contrast, the strong message of the Gaia biocentric-geocentric paradigm is the recovery of the human condition as an ordered system, accompanied, however, by the loss of any qualitative difference between man and ocher living organisms.

If all this is true, or we may better say plausible, the biocentric approach to man in order to understand man himself, defend his variability, cultural included, (as the basis of any ecological and ethological equilibrium in the scale of living things and the biosphere), and to build a global ethics deserves extreme attention, yet leads to insoluble aporias.

Each of the two current models of biocentric interpretation of the biosphere and man lends itself, with equal consistency, to op-posing ethical, philosophical and socio-economic developments.

It appears, therefore, at all events in the present state of the art, that the aporias of biocentrism can only be solved by moving out of the biocentric reference system. To put the matter in simple, yet clear terms, the answer to philosophical and ethical problems lies in the choice between Nietzsche's *amor fati* and the raft in Plato's *Phaedo*. In either case, a human specificity that is also composed of myths and aesthetic, philosophical and religious moments is regained.

Nevertheless there is thus not a stated need to accept Goldsmith's (1997) proposals and refuse the scientific and rational man. A human specificity is also perceived in strictly scientific terms: the choice of ritualization as the focal point of both animal behaviour and human behaviour, since "man cannot exist without the support furnished by his belonging to a culture and his participation in its goods" (Lorenz 1973), leaves no room for misunderstanding.

This, however, is another story, one that is not such as to be recounted here. It is up to the philosopher and the theologian to tell it, though it would be injust if in so doing they were to dispense with the contribution of the biologist.

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