TEORIA

T

Rivista di filosofia
fondata da Vittorio Sainati
XXXIV/2014/1 (Terza serie IX/1)

Rethinking "Nature"

Ripensare la "natura"

1. Burning Issues/Questioni aperte

Edizioni ETS

Indice

Flavia Monceri
Premise/Premessa, p. 5

Ted Benton
Get Real! Nature without Scare-Quotes, p. 7

Alexander Riegler
Towards the Consistent Construction of Nature, p. 33

Andrea Aguti
Perché e come ripensare oggi la natura, p. 45

Riccardo Manzotti
Galileo Debunked: A Neutral Foundation for Nature, p. 57

Marta Bertolaso
Why It Proves so Difficult to Pin Down a Definition of Nature, p. 75

Joseph A. Raho
Rethinking Nature Through Synthetic Biology, p. 93

Koen B. Tanghe
Robots on Spaceship Earth: A Theoretical Plea for Machine Metaphors, p. 113

Robert Zwijnenberg
Biotechnology, Human Dignity and the Importance of Art, p. 131

Theodore Grudin
The Artinatural and the Importance of Nature Studies, p. 149

Lars Tønder
Public Reason Renaturalized, p. 165

Flavia Monceri
The Nature of the "Ruling Body": Embodiment, Ableism and Normalcy, p. 183

T

Robots on Spaceship Earth: A Theoretical Plea for Machine Metaphors

Koen B. Tanghe

> It is astonishing what a different result one gets by changing the metaphor!
> George Eliot (1860: 80)

Introduction: Nature and the human Umwelt

Jakob von Uexküll, a pioneer of biosemiotics and ethology, in the early twentieth century gave a new meaning to the nineteenth-century term *Umwelt* (Sutrop 2001): the world as experienced by a specific species. The frequency of citation of Uexküll's concept in semiotics is growing rapidly (Kull 1998). I believe that it can also be useful in philosophy and in particular in a philosophical reconsideration of nature. The *Umwelt* of a particular species must for starters be contrasted with the unknowable world as it is (the noumenon in the classic two-worlds interpretation of Kant's transcendental idealism). A distinction can furthermore be made between the perceptual (representation) and the cognitive (understanding) *Umwelt*[1]. Lastly, Uexküll was not a Darwinist, but an *Umwelt* normally fits an animal's particular ecological niche, i.e., its way of life in a specific habitat, as neatly as morphological features. Old World monkeys, for example, rely on their trichromatic color vision to detect fruit against a background of leaves. Flies are highly dependent on their capacity to process almost seven times more visual information per second than humans to evade predators (and newspapers and more traditional flyswatters). Serious mismatches between *Umwelten* and niches can therefore be as fatal as grave

[1] Plants have a primitive perceptual *Umwelt* (e.g., Blancaflor 2012), but not a cognitive *Umwelt*.

mismatches between morphological features and niches. Also, a change of niche will often be accompanied or facilitated by a change of *Umwelt*.

Nature is «perhaps the most complex word in the language» (Williams 1983: 219). One of the causes of the confusion may be that we normally don't make a clear distinction between nature as it is and our representation and understanding of nature. When we use the term to refer to "everything there is" ("universal nature", Castree 2001), we often mean to say "everything there is as perceived and understood by us" (i.e., our *Umwelt*). Our "nature" certainly differs profoundly from the "nature" of our medieval ancestors. The term "nature" can also refer to "wildlife or things and places on Earth which more or less persist in a natural state, undisturbed by man and his culture" ("external nature") or "an essential quality or inherent force of something, as in human nature versus nurture" ("intrinsic nature"). The false dichotomy between nature and nurture has been deconstructed, although it will probably never disappear (e.g., Pinker 2004). The same is the case for the dichotomy between nature and man/culture (Gray 2002 criticizes it; for a defense, see, e.g., Moriarty 2007). «Man is a part of Nature», Russell (1925: 1) wrote, «not something contrasted with Nature». James Lovelock called us mechanically advanced beavers. We are indeed a very "transformative" part of nature. Morton (2011) even compares human intelligence with plate tectonics or photosynthesis. The real question, in any case, is not whether we, including our culture, are a part of nature, but how we should conceptualize and interpret "nature". Whereas many believe that we should return to a more intuitive and organic conceptualization, I here argue the opposite.

My point of departure is the "natural" human *Umwelt* (section 1). The industrial-technological way of life of modern man has been facilitated by a transition to an *Umwelt* that is to some extent characterized by a mechanistic (as opposed to teleological and agential) understanding of nature and by the use of machine metaphors (section 2). This transition is far from complete and universal, though: modern, Western or westernized man lives in or with a complex and hybrid, semi-scientific *Umwelt*. It is in particular still permeated by powerful religious or quasi-religious concepts and metaphors, many of which are remnants of premodern *Umwelten*. They are one of the causes of a mismatch between our modern niche and our *Umwelt* (section 3). It is a purely theoretical and hopelessly utopian plea, but it will be argued that the replacement of these archaic concepts and metaphors with machine metaphors would result in a better match between our *Umwelt* and niche (conclusion).

1. *Two core features of "natural" human* Umwelten

The attempt to identify features that meaningfully distinguish man from other animals has been disappointingly futile. Famous, in this respect, is Diogenes' of Sinope anecdotal reaction to Plato's definition of man ("a bipedal living being without feathers"): he plucked all of the feathers from a rooster and delivered it to Plato, upon which Plato had to add yet another qualification – "with flat toenails". Many centuries later, Goethe was exhilarated by his discovery of the supposedly non-existing human *os intermaxillare* (he did not realize that he had been preceded by Félix Vick d'Azyr). It is, in this light, quite ironic that the application of the original *Umwelt* concept to man has proven to be somewhat controversial, since nothing distinguishes us from other animals more clearly than our "rich" and "deep" cognitive *Umwelt* (e.g., Landmann 1966: 163-174). I will here focus on only two correlated features of "natural" human *Umwelten*: language and religion.

Language is «a means for sorting and manipulating the plethora of information that deluges us throughout our waking life» (Bickerton 1990: 5). Our concepts indeed to some extent structure our perception and behavior (linguistic determinism). Most originate as metaphors: the nineteenth-century German writer Jean Paul aptly called language «a dictionary of bleached metaphors». Metaphors are ubiquitous and influential ingredients of languages and therefore, *ipso facto*, crucial constituents of human *Umwelten*. Not only do we use, on average, six metaphors per seventeen words, they also provide «the only ways to perceive and experience much of the world» (Lakoff and Johnson 1980: 239). They structure our perception, thought and behavior, often without us realizing it. Thibodeau and Boroditsky (2011), for example, have shown that people are most likely to call for strong law enforcement when a crime is presented as a beast and that they are more prone to accepting solutions such as rehabilitation when it is presented as a virus. The participants in this study were completely unaware that these two metaphors determined their decision. They believed instead that their choice was inspired by objective parameters.

George Eliot (1860: 80) wondered why «we can so seldom declare what a thing is, except by saying it is something else?». Even the practice of science and philosophy is a «war of metaphors» (Dennett 1991: 455). We are in particular inclined to try to understand new or more abstract domains through «our experiences with the physical world» (Kövecses 2010: 7). Or, as Brown (2003: 184) puts it: «Presented with new aspects of the world, we humans understand them in terms of deeply ingrained bodily and social

experiences that already form the framework for dealing with life on a day-to-day basis». A possible explanation for this striking cognitive inclination is that neural circuits that steer our motor, sensory and social functioning were given a new, linguistic task when we evolved to process abstract thoughts.

This brings us to a second important feature of human *Umwelten*: they are or tend to be highly agential, i.e., nature tends to be interpreted in terms of agential metaphors such as ancestors, gods, witches, devils, angels, and so forth. Boyer (1994) points out that a belief in non-physical beings is the defining feature of religions. Likewise, Mithen (1996: 175-176) states that, since the classic work of E.B. Tylor (1871), the idea of non-physical beings has «been taken for the very definition of religion itself». Even death was personified (Thanatos, Dullahan, Azrael, Michael, and so forth). Modern hunter-gatherers all think about the natural world as if it were imbued with will and purpose (e.g., Mithen 1996: 47-48). Nature was and to a certain extent remains identified or at least associated with these agential metaphors: religious people do not realize that they are using metaphors.

This agential or religious nature of our "natural" *Umwelt* seems, like the evolution of language itself, to be directly linked to the main factor behind the evolution of the brain, the organ that generates our *Umwelt*. According to the social brain hypothesis (Dunbar 1993, 2009; Dávid-Barrett and Dunbar 2013), our neocortex primarily evolved as an adaptation to a more complex social environment (Kapogiannis *et al*. 2009 found tentative evidence for the thesis that religions are productions of the social brain). The question is not whether this was an important factor behind the evolution of our brain and our cognitive *Umwelt*, but rather whether it was the main factor. Mithen (1996), for example, identifies three cognitive domains or intelligences: the social, the technical and the natural history domain, with each being constituted by a bundle of interacting mental modules. However, even in Mithen's theory, the social domain stands central.

We developed a sophisticated theory of mind: the automatic tendency to attribute mental states such as beliefs, intentions and goals to others and the ability to imagine these mental states and thus to understand, mimic and manipulate other people (e.g., Schlinger 2009). Three-year-old children already appear to understand that other people have goals and beliefs that determine their behavior (Wellman 1990). This kind of agential thinking is, from a very early age, extended to the biological and even the non-biological world. Deborah Kelemen (2004: 295) succinctly speaks of «promiscuous teleology». At a certain point in time, we apparently began to use our social brain or the social domain to think about non-human

nature, instead of only about other human beings. According to Mithen, this "overflowing" of the social domain into the natural world started when we began to use language as a means for communicating abstract thought. Thanks to modern language, knowledge that had previously been trapped in separate domains and of which we were hardly conscious at all (consciousness was largely limited to the social sphere) was pulled into the social domain and became the subject of conscious thought and creativity: cognition became fluid. The result was, 100,000 to 30,000 years ago, a cultural explosion, including the birth of religions.

Mithen was inspired by Dunbar (1996) who also associated the evolution of abstract language with complex symbolic culture, including rituals and religions. The original evolutionary function of language, however, was to allow social bonding between groups of hominids, once they became too large for bonding through grooming (Dunbar 1993, 1996; see also Dávid-Barrett and Dunbar 2013). Our modern linguistic behavior still betrays that social origin: gossip forms an important part of daily life (Dunbar 1996). Modern languages also betray their social origin in that they are permeated with agential metaphors and metaphorical expressions. Cognitive psychologists call the inclination to endow the inanimate with animate, emotional or expressive qualities the physiognomic perception (physiognomic projection is the property of addressing inanimate objects as if they were living beings). Linguists have also long observed that we tend to use the same concepts and structures whether talking about animate or inanimate entities: we talk about inanimate objects as if they were living things. The sentence "the book fell off the shelf", for example, is equivalent in structure to the sentence "the man fell off the ladder".

Even scientists can hardly avoid talking about animals, plants, cells or molecules without somehow assuming that they are beings with goals and intentions (e.g., selfish genes and chaperone molecules). Dennett (2011: 481) calls it the «power of the intentional stance». These agential metaphors have the potential not only to mislead the public but also the scientists themselves, even though they fully realize that such are only metaphors. In 1869, Darwin admitted in a letter to Wallace that he had been misled by his breeding analogy to assume that single variations would be preserved in a population. Likewise, Dawkins (2006: ix) has conceded that he has been misled by his selfish gene metaphor. Even the mere analogy with organisms can be misleading. Lovelock's Gaia metaphor is a good example. Biological processes influence abiotic processes but these biological feedbacks do not, in contrast to what Lovelock claims, «generally

enhance the self-regulation of the atmosphere-biosphere system […]» (Kirchner 2003: 22) in the same way that an organism regulates itself. Likewise, Darwin began his evolutionary theorizing (1837-1839) with an organism analogy (Hodge 1985): he compared extinctions with the death of an organism (species senescence) and the coming into being of new species with reproduction. The metaphor of society as an organism (MacLay 1990) was the source of the highly influential idea of historical decline: if societies are like organisms, they must eventually face decline and death (Herman 1997: 106). Ecologists are influenced unknowingly by the popular metaphor of the ecosystem as a community (Silver 2006: 219-221).

2. *The partial mechanization of our* Umwelt

The rise of the scientific method has in large measure depended on human thinkers «disciplining themselves to abjure transactional, sociomagical styles of reasoning» (Humphrey 1976: 315). Thinking in terms of beings and goals was increasingly replaced with mechanistic and ateleological thinking. «This anti-teleological line of thought reaches its climax in the Darwinian theory of the nineteenth century, which seeks to explain organic forms causally and mechanically, without any appeal to vital force or purpose of any kind in the things or outside of them» (Thilly 1965: 269, see also Dennett 1995 and Inkpen forthcoming). This disciplining, in my opinion, also marks the true birth of the modern dichotomy between nature and man (Collingwood 1945, Merchant 1980, Callicott 1992): it came into being when we stopped interpreting nature in human (social, agential and teleological) terms. Our resulting alienation from nature has been an important philosophical theme and challenge ever since. Countless thinkers, from Hegel to Teilhard de Chardin and Whitehead, have tried to rethink nature in more human, agential, teleological or ensouled terms.

The Greeks were among the first to coin a specific term for non-human phenomena (Macnaghten and Urry 1998), but even they still conceived this natural world as permeated by mind and *telos*. It was «a rational animal with a mind of its own» (Collingwood 1945: 3). By contrast, Francis Bacon compared final causes to the Vestal virgins who served at Roman temples. Like them, he said, they are dedicated to God and are barren. «If we trace the history of the progress of the human mind», Laplace wrote in his *Exposition* (1796), «and of its errors, we shall observe final causes perpetually receding, according as the boundaries of our knowledge are

extended» (quoted in Greene 1973: 37). Shanks (2004: 30) puts it thus:

> Surveying these events, it is fair to say that correlative with the rise of modern science is the dual phenomenon of nature being conceptualized with the aid of mechanical metaphors and nature being studied with the aid of machines (telescopes, microscopes, barometers, vacuum pumps, and so on).

Biology in particular, has, since the seventeenth century, been a working out of «Descarte's [sic] original metaphor of the organism as machine» (Lewontin 2001: 1263). This mechanization wasn't inspired by religious doubts, nor did it lead immediately to such doubts. On the contrary, the design argument for the existence of God was rather bolstered by the rise of modern science. Indeed, some modern scholars (e.g., Pigliucci and Boudry 2011) even argue against the use of machine metaphors because of their misuse by creationists. However, the ultimate Christian agent was, nevertheless, relegated to the role of original designer of nature. The "mechanick theists", as they were called,

> attempted to weld into a single philosophy of nature two not entirely compatible conceptions: one, the idea of nature as a law-bound system of matter and motion, and two, the idea of nature as a habitation created for the use and edification of intelligent beings by an omnipotent, omniscient, and benevolent God (Greene 1973: 12).

Newton opposed the autonomous clockwork universe (in his universe, God still intervened) and the eager use, by scholars, of his mechanical laws of motion to spin theories of the origin of the Earth and the solar system, but to no avail: the natural theologists ended «by eliminating God from His works and overthrowing the chief argument for His existence: namely, the wise adaptation of the present frame of nature to the need of living creatures, especially man» (*ibid.*: 13).

The scientific revolution «outshines everything since the rise of Christianity» (Butterfield 1949: vii) and «looms so large as the real origin both of the modern world and of the modern mentality that our customary periodization of European history has become an anachronism and an encumbrance» (*ibid.*: viii). I believe that modern science outshines everything since at least the Neolithic Revolution. It radically transformed and still is transforming our *Umwelt*[2]. In a couple of centuries, we made more

[2] It was the second major *cultural* (as opposed to biological or genetically facilitated) *Umwelt*-shift in our evolution (see note 3).

progress toward a better understanding of nature than during the 3.6 billion years that preceded this revolution. It facilitated, together with the associated belief in progress (Bury 1920), the transition to our modern industrial-technological niche, i.e., the industrial-technological exploitation and modification of Earth (Jacob 2006, Spadafora 1990), resulting in a budding anthropogenic biosphere (e.g., Ellis 2011a)[3]. It is well-known that our hunter-gatherer bodies are not very well adapted to that new niche, leading to what Lieberman (2013) calls "mismatch diseases". I believe that the same can be said of our hunter-gatherer brain and that this has resulted in a "mismatch *Umwelt*".

3. *The mismatch with our modern niche*

Animals often manipulate and alter their habitat or elements of their habitat in order to satisfy their needs and the needs of their offspring, a phenomenon that is still underestimated and underresearched (Odling-Smee, Laland and Feldman 2003). This niche alteration and construction introduces feedback into the evolutionary dynamic. It significantly modifies the selection pressures acting on both the species themselves and on other species. *Homo sapiens* can be defined as an omnivore, specialized in niche construction, i.e., in meeting his needs by altering and manipulating his habitat and thus also in steering his own evolution and that of other species. The transition from an existence as largely vegetarian tree dweller to one as scavenger, hunter and gatherer was already facilitated by the use of tools. This niche construction in turn steered human evolution. Throwing rocks and swinging clubs at adversaries, for example, led to extensive anatomical remodeling of the human hand: the two modern handgrips, the "precision grip" and "power grip", represent a throwing grip and a clubbing grip (Young 2003). Other examples of cultural inventions that steered human evolution are spears (Roach *et al*. 2013), cooking (Wrangham 2009) and, possibly, agriculture (Cochran and Harpending 2009).

The agricultural exploitation of our habitats certainly had a noticeable

[3] Cauvin (2000) argues that the first cultural wave or niche-shift (the Neolithic Revolution) was also facilitated by a "mental transformation", i.e., a cultural *Umwelt*-shift. Man could not transform his means of subsistence and his society «without showing at the same time a different conception of the world and of himself in that world» (Cauvin 2000: 220). Some interpret the site Göbekli tepe (12.000-10.000 BP) as a confirmation of Cauvin's theory (e.g., Schmidt 2010).

impact on the planet. Humans now «truly began to harness the earth. […] farmers utilize the landscape intensively and create a milieu that suits their needs» (Price and Bar-Yosef 2011: S171). Ruddiman (2005) calls farming the largest alteration of the Earth's surface from its natural state that humans have yet achieved. Even the New World, including the Amazonian rain forest, was, by 1492, largely anthropogenic (Mann 2005). The Neolithic Revolution also marks the start of man's alteration of the Earth's climate (e.g., Pongratz and Caldeira 2012). Our farming ancestors may thus have averted or helped avert the onset of a new ice age (Ruddiman 2005) or even a semi-permanent ice age (Crowley and Hyde 2008).

In the mean time, the human impact on the atmo-, bio-, hydro- (liquid water), cryo- (the ice sheets and glaciers) and geosphere has become so extensive that many scholars speak of a new age: the Anthropocene (Ellis 2011a, Zalasiewicz *et al*. 2011) (the Yupik-Inuit already referred to westerners as "the people who change nature"). Or, as Ellis (2011b) puts it: «Forget Mother Nature: This is a World of Our Making». We are slowly but steadily turning the entire planet into an anthropogenic habitat. We may, eventually, even remake ourselves (Silver 1998). This is, whether one likes it or not, our evolutionary destiny as the niche constructing species *par excellence*. However, «If humanity's role has expanded to the point that the entire Earth is our niche, the trend of the changes we have made lately indicates that we are doing a poor job of niche maintenance» (Brand 2010: 275). I am afraid that our *Umwelt* is unsuited for our new niche in more than one way. However, I will here focus on mainly one mismatch.

Environmental theorists like Merchant (1980) of course argue that we used to treat nature better back in the days when everybody exclusively thought of it in organismic and agential terms. Suggestions that we should return to such a conceptualization of nature (Callicott 1992, Goldsmith 1992) and "reenchant" our mechanized world (Berman 1981), originate in eighteenth-century Romanticism (Herman 1997). For the *Naturphilosophen*, for example, the world was, once again, an enchanted and ensouled being [*anima mundi*], not a machine (for a history of this idea, see Bonifazi 1978), one of which human beings were or should be a part (hence Goethe's joy in finding the human *os intermaxillare*). Likewise, McKibben, in his influential bestseller *The End of Nature* (1989), laments the disappearance of nature as a separate, undisturbed entity and abhors the idea of a managed, anthropogenic planet. It is clear that he worships nature as if it were some kind of sacred being or a creation by a sacred being. Rain, for instance, loses its special, sacred power once it bears the permanent stamp

of modern man. «Instead of being a category like God – something beyond our control – it is now a category like the defense budget or the minimum wage, a problem we must work out» (McKibben 1989: 229). He also speaks of the lack of "reverence" for genetically engineered rabbits (*ibid.*: 230), trout (*ibid.*: 232) and plants (*ibid.*: 175). The end of nature may, «for those of us who have tended to locate God in nature» (*ibid.*: 85), even have the same, faith-shattering effects as the Holocaust. However, the scientific evidence seems, as we saw, to contradict the Romantic idea of a pristine premodern world: the Anthropocene started 10,000 years ago.

We should indeed forget Mother Nature, that projection of our social brain, and accept the anthropogenic reality. Seen this way, it is precisely the ancient, agential way of thinking about nature that Merchant *et al.* defend that is problematic. It continues to exert a certain influence on modern societies and is holding us back at a time at which we should be making rapid progress. It in particular contributes to the impediment of progress in two important domains: biotechnology (especially genetic engineering) and geoengineering. Both are of crucial importance in the further construction of the anthropogenic habitat. In *Terraforming Earth: Geoengineering Megaplan Starts Now* (2013), Michael Marschal argues that we should immediately research various geoengineering techniques because we are running out of time. In reality, hardly any sizeable research at all has been done. Geoengineering was until very recently a taboo, even among scientists. The public is open to the idea of researching geoengineering, «while holding significant reservations about ever deploying it» (Corner *et al.* 2013: 941). The opposition against certain biotechnological developments and in particular genetically manipulated crops is also well-known (e.g., Silver 2006). There are several reasons for this resistance, but an important cause is that these technologies are deemed a "blasphemous" violation of nature. Williams (2002: 5) speaks of a «deeply rooted myth in the Western psyche and its culture that nature is a passive, harmonious, God-given backdrop against which the drama of human life is played out». Interfering with this God-given or God-like natural order is taboo and dangerous, as evidenced by countless science fiction stories and movies (Schelde 1993), ranging from Shelley's *Frankenstein* (1818) to *The Rise of the Planet of the Apes* (2011).

The aforementioned «two not entirely compatible conceptions» of nature, the agential and the mechanistic conception, are clearly still with us today. Many in the West fear that biotechnology will «violate an unseen entity […]» (Silver 2006: xi). For those on the right, it is the God of the Bible, those on the left «have transferred their allegiance to a vague Mother

Nature goddess here on earth – although they usually don't verbalize their feelings in such terms» (*ibid.*: xi). The reason why advocates of organic food accept breeding techniques but not directed genetic engineering is that they believe that «the methods of Mother Nature are sacred, and that human modification of genes violates her spiritual integrity» (*ibid.*: 269). Analyses of public discourses of, or ideas about, genetically modified food (Shaw 2002, Hansen 2006) and geoengineering (Corner *et al*. 2013) reveal the same fear: these technologies are, like nuclear energy (Weart 1988) or nanotechnology (Scheufele *et al*. 2008), seen as unnatural and therefore inappropriate and unethical. Nature is thereby often portrayed as a powerful Goddess who «will "hit back" at inappropriate human intervention» (Shaw 2002: 281) or who "knows" she has a problem and will "cleanse" herself of the human rash (Corner *et al*. 2013: 945).

Conclusion: a plea for machine metaphors

The "diagnosis" is clear: there is a clear mismatch between the *Umwelt* of modern society and its industrial-technological niche in that the *Umwelt* is replete with agential metaphors (or notions that can be interpreted as such) that, as we have just seen, constitute an impediment to the further construction of that niche. They prime people to oppose progress in important domains: a holy and stable, God-like or God-given natural order may not be interfered with. The "remedy" is, *theoretically*, very simple. These agential metaphors should be abolished and, in some cases, replaced with metaphors that better match the modern human niche, i.e., machine metaphors, as machine-like entities can and should be tuned and modified[4]. This radical replacement should start in childhood. Maynard Smith (1984) believed that we need both science and myths, but that they should be kept strictly apart. I beg to differ. Myths are one of the means whereby the unconscious foundations of an *Umwelt* are laid. They therefore ought to be inspired by, and based on, science and machine metaphors instead of being kept apart from science[5].

Let me, again, emphasize that this is a purely theoretical plea: our social

[4] The effectiveness of this "remedy" could be tentatively tested through an experiment, similar to that of Thibodeau and Boroditsky (2011).

[5] In traditional societies, myths are seen as true stories and opposed to false stories (Eliade 1963).

brain is, to a greater or lesser extent, addicted to an agential interpretation of nature. A radical eradication of such an interpretation is therefore all but impossible – much as we cannot improve the perceptual *Umwelt* of a particular species by enhancing one of its senses. Even scientists can, as we have seen, and as the dubious success of the selfish gene metaphor illustrates, fall under the spell of agential metaphors. However, I will, nevertheless, end this analysis with a few words about a twin root metaphor that should or would stand central in a fully "mechanized" human *Umwelt*: that we are self-conscious and highly sophisticated but far from perfect "robots", living on board a giant and wonderful but also potentially dangerous "spaceship".

The modern depiction of the ancient *machina mundi* as a spaceship dates from the nineteenth century. The metaphor became more prevalent, once we began, in the 1950s, to build and launch spaceships and after the first satellite photographs of Earth were released by NASA in the late 1960s. However, it remains somewhat marginal, certainly compared to the Gaia metaphor. The real stumbling block, though, is its "twin", the metaphor that should occupy the central position in the sciences that study man: de La Mettrie's *l'homme machine*. Few oppose the idea that our body resembles a machine; however, our conscious mind allegedly still belongs to a sphere of its own. This may be the ultimate source of agential thinking: the self-evident and deeply rooted assumption that "we" (our conscious "I"), are, as agents, in control of "ourselves" (the human organism)[6]. Alas, while we may be uniquely self-reflective animals, that does not mean that "we" are in so meaningful a way in control as we tend and like to believe. In that ambitious sense, free will is nothing but a classic, prescientific illusion (e.g., Flanagan 2002), right up there with the illusion that the Earth is flat, life and the universe static or time and space absolute. As has been the case with previous illusions of knowledge, its scientific shattering will or would have important repercussions (e.g., Verplaetse 2011).

The so-called agency illusion is undoubtedly, like the belief in supernatural agents, adaptive (e.g., Rakos 2004), i.e., it was adaptive in the niche in which it evolved. One may wonder though, whether it is still as adaptive now that we have acquired almost God-like powers, i.e., whether this belief does not constitute another mismatch between our *Umwelt* and our niche.

[6] It is of course highly ironic that it was one of the fathers of the modern, mechanistic interpretation of the world, Descartes, who, with his strict dualism between mind and matter, cemented this illusion in the modern mind. He thus also contributed to the modern separation between man and nature.

Brand (2010: 1) writes: «We are as gods and HAVE to get good at it» (see also Lynas 2011). Ironically, if we truly were as gods, instead of self-conscious animals, if our conscious, rational "I" truly were in full control, we would probably not have to get good at being like gods, i.e., we would not be confronted with potentially apocalyptic problems like overpopulation and climate change. In any case: we will indeed increasingly need to act as gods or face the consequences of not acting. We should proceed very cautiously in "taboo" domains such as genetic engineering and geoengineering, but proceed we should. In his latest book, Craig Venter (2013) writes that he is not concerned with complaints about man playing God. His greatest fear is not the abuse of technology but that we do not use it at all. In his vision, synthetic organisms will heal the planet and extend humanity's reach beyond Earth. This may smack of classic techno-hubris; however, it is indeed not exuberant techno-optimism that should be feared most, but pessimism and immobilism, inspired by anxiety and agential eco-worship.

Acknowledgments

I am grateful to Dr. Stefaan Blancke and an anonymous referee for critical comments.

References

Berman, M. (1981), *The Reenchantment of the World*, Cornell University Press, Ithaca, NY.

Bickerton, D. (1990), *Language and Species*, The University of Chicago Press, Chicago.

Blancaflor, E.B. (2012), *Regulation of Plant Gravity Sensing and Signaling* [sic] *by the Actin Cytoskeleton*, in «American Journal of Botany», vol. 100, n. 1, pp. 143-152.

Bonifazi, C. (1978), *The Soul of the World: An Account of the Inwardness of Things*, University Press of America, Lanham.

Boyer, P. (1994), *The Naturalness of Religious Ideas: A Cognitive Theory of Religion*, University of California Press, Berkeley.

Brand, S. (2010), *Whole Earth Discipline: Why Dense Cities, Nuclear Power, Transgenic Crops, Restored Wildlands, Radical Science, and Geoengineering Are Necessary*, Atlantic Books, London.

Brown, T.L. (2003), *Making Truth: Metaphor in Science*, University of Illinois Press, Champaign.

Bury, B.J. (1920), *The Idea of Progress*, Macmillan, London.

Butterfield, H. (1949), *The Origins of Modern Science, 1300-1800*, G. Bell, London.

Callicott, J.B. (1992), *La Nature est morte, vive la nature!*, in «The Hastings Center Report», vol. 22, n. 5, pp. 16-23.

Castree, N. (2001), *Socialising Nature: Theory, Practice, and Politics*, in N. Castree and B. Braun (eds.), *Social Nature: Theory, Practice and Politics*, Blackwell, Oxford 2001, pp. 1-21.

Cauvin, J. (2000), *The Birth of the Gods and the Origins of Agriculture*, transl. by T. Watkins, Cambridge University Press, Cambridge.

Cochran, C. and Harpending, H. (2009), *The 10.000 Year Explosion: How Civilization Accelerated Human Evolution*, Basic Books, New York.

Collingwood, R.G. (1945), *The Idea of Nature*, Clarendon Press, Oxford

Corner, A. *et al*. (2013), *Messing with Nature? Exploring Public Perceptions of Geoengineering in the UK*, in «Global Environmental Change», vol. 23, n. 5, pp. 938-947.

Crowley, T.J. and Hyde, W.T. (2008), *Transient Nature of Late Pleistocene Climate Variability*, in «Nature», vol. 456, n. 7219, pp. 226-230.

Dávid-Barrett, T. and Dunbar, R.I.M. (2013), *Processing Power Limits Social Group Size: Computational Evidence for the Cognitive Costs of Sociality*, in «Proceedings of the Royal Society B», vol. 280, n. 1765, 20131151.

Dawkins, R. (2006), *The Selfish Gene*, third, 30th anniversary ed., Oxford University Press, Oxford and New York.

Dennett, D.C. (1991), *Consciousness Explained*, Back Bay Books, Boston.

Dennett, D.C. (1995), *Darwin's Dangerous Idea*: *Evolution and the Meanings of Life*, Simon & Schuster, New York.

Dennett, D.C. (2011), *Homunculi Rule: Reflections on Darwinian Populations and Natural Selection by Peter Godfrey Smith*, in «Biology and Philosophy», vol. 26, n. 4, pp. 475-488.

Dunbar, R.I.M. (1993), *Coevolution of Neocortex Size, Group size and Language in Humans*, in «Behavioral and Brain Sciences», vol. 16, n. 4, pp. 681-735.

Dunbar, R.I.M. (1996), *Grooming, Gossip, and the Evolution of Language*, Harvard University Press, Cambridge, Mass.

Dunbar, R.I.M. (2009), *The Social Brain Hypothesis and Its Implications for Social Evolution*, in «Annals of Human Biology», vol. 36, n. 5, pp. 562-572.

Eliade, M. (1963), *Myth and Reality*, transl. by W.R. Trask, Harper & Row, New York.

Eliot, G. (1860), *The Mill on the Floss*, William Blackwood, Edinburgh.

Ellis, E.C. (2011a), *Anthropogenic Transformation of the Terrestrial Biosphere*, in «Philosophical Transactions of the Royal Society A», vol. 369, n. 1938, pp. 1010-1035.

Ellis, E.C. (2011b), *Forget Mother Nature: This is a World of Our Making*, in «New Scientist», vol. 210, n. 2816, pp. 26-27.

Flanagan, O. (2002), *The Problem of the Soul: Two Visions of the Mind and How to Reconcile Them*, Basic Books, New York.

Goldsmith, E.R.D. (1992), *The Way: An Ecological World View*, Rider Books, London.

Gray, J. (2002), *Straw Dogs: Thoughts on Humans and Other Animals*, Granta, London.

Greene, J.C. (1973), *The Death of Adam: Evolution and Its Impact on Western Thought*, The Iowa State University Press, Ames.

Hansen, A. (2006), *Tampering with Nature: "Nature" and the "Natural" in Media Coverage of Genetics and Biotechnology*, in «Media Culture Society», vol. 28, n. 6, pp. 811-834.

Herman, A.L. (1997), *The Idea of Decline in Western History*, Free Press, New York.

Hodge, M.J.S. (1985), *Darwin as a Lifelong Generation Theorist*, in D. Kohn (ed.), *The Darwinian Heritage*, Princeton University Press, Princeton 1985, pp. 207-243.

Humphrey, N.K. (1976), *The Social Function of Intellect*, in P.P.G. Bateson and R.A. Hinde (eds.), *Growing Points in Ethology*, Cambridge University Press, Cambridge 1976, pp. 303-317.

Inkpen, S.A. (forthcoming), *Likening Nature to Artifice: Darwin and the Mechanical Philosophy*, in «Endeavour».

Jacob, M.C. (2006), *Scientific Culture and the Origins of the First Industrial Revolution*, in «Historia e Economia. Revista Interdisciplinar», vol. 2, n. 1/2, pp. 55-70.

Kapogiannis, D. *et al.* (2009), *Cognitive and Neural Foundations of Religious Belief*, in «Proceedings of the National Academy of Sciences», vol. 106, n. 12, pp. 4876-4881.

Kelemen, D. (2004), *Are Children "Intuitive Theists"? Reasoning about Purpose and Design in Nature*, in «Psychological Science», vol. 15, n. 5, pp. 295-301.

Kirchner, J.W. (2003), *The Gaia Hypothesis: Conjectures and Refutations*, in «Climatic Change», vol. 58, n. 1/2, pp. 21-45.

Kövecses, Z. (2010), *Metaphor*, Oxford University Press, Oxford and New York.

Kull, K. (1998), *On Semiosis, Umwelt, and Semiosphere*, in «Semiotica», vol. 120, n. 3/4, pp. 299-310.

Lakoff, G. and Johnson, M. (1980), *Metaphors We Live By*, University of Chicago Press, Chicago.

Landmann, M. (1966), *Filosofische Antropologie*, Het Spectrum, Utrecht.

Laplace, P.S. de (1796), *Exposition du Système du Monde*, Imprimerie du Cercle-Social, Paris.

Lewontin, R.C. (2001), *In the Beginning Was the Word*, in «Science», vol. 291, n. 5507, pp. 1263-1264.

Lieberman, D. (2013), *The Story of the Human Body, Evolution, Health, and Disease*, Allen Lane, London.

Lynas, M. (2011), *The God Species: Saving the Planet in the Age of Humans*, National Geographic Society, Washington.

MacLay, G.R. (1990), *The Social Organism: A Short History of the Idea That a Human Society May Be Regarded As a Gigantic Living Creature*, North River Press, Croton-on-Hudson, NY.

Macnaghten, P. and Urry, J. (1998), *Contested Natures*, Sage, London.

Mann, C.C. (2005), *1491: New Revelations of the Americas Before Columbus*, Knopf, New York.

Marschal, M. (2013), *Terraforming Earth: Geoengineering Megaplan Starts Now*, in «New Scientist», vol. 220, n. 2938, pp. 10-11.

Maynard Smith, J. (1984), *Science and Myth*, in «Natural History», vol. 93, n. 11, pp. 10-24.

McKibben, B. (1989), *The End of Nature: Humanity, Climate Change and the Natural World*, Random House, New York.

Merchant, C. (1980), *The Death of Nature: Women, Ecology, and the Scientific Revolution*, HarperCollins, San Francisco.

Mithen, S. (1996), *The Prehistory of the Mind: A Search for the Origins of Art, Religion and Science*, Phoenix, London.

Moriarty, P.V. (2007), *Nature Naturalized: A Darwinian Defense of the Nature/Culture Distinction*, in «Environmental Ethics», vol. 29, n. 3, pp. 227-246.

Morton, O. (2011), *The Anthropocene*: *A Man-made World*, in «The Economist», vol. 399, n. 8735, pp. 81-83.

Odling-Smee, F.J., Laland, K.N. and Feldman, M.W. (2003), *Niche Construction: The Neglected Process in Evolution (MPB-37)*, Princeton University Press, Princeton.

Pigliucci, M. and Boudry, M. (2011), *Why Machine-Information Metaphors are Bad for Science and Science Education*, in «Science & Education», vol. 20, n. 4/5, pp 453-471.

Pinker, S. (2004), *Why Nature & Nurture Won't Go Away*, in «Daedalus», vol. 133, n. 4, pp. 5-17.

Pongratz, J. and Caldeira, K. (2012), *Attribution of Atmospheric CO_2 and Temperature Increases to Regions: Importance of Preindustrial Land Use Change*, in «Environmental Research Letters», vol. 7, n. 3, 034001.

Price, T.D. and Bar-Yosef, O. (2011), *The Origins of Agriculture: New Data, New Ideas: An Introduction to Supplement 4*, in «Current Anthropology», vol. 52, n. S4, pp. S163-S174.

Rakos, R.F. (2004), *The Belief in Free Will as a Biological Adaptation: Thinking Inside and Outside the Behavior Analytic Box*, in «European Journal of Behavior Analysis», vol. 5, n. 2, pp. 95-103.

Roach, N.T. *et al*. (2013), *Elastic Energy Storage in the Shoulder and the Evolution of High-speed Throwing in Homo*, in «Nature», vol. 498, n. 7455, pp. 483-486.

Ruddiman, W. (2005), *Plows, Plagues and Petroleum: How Humans Took Control of Climate*, Princeton University Press, Princeton.

Russell, B. (1925), *What I Believe*, Kegan Paul, Trench Trubner & Co, London.

Schelde, P. (1993), *Androids, Humanoids and Other Science Fiction Monsters: Science and Soul in Science Fiction Films*, New York University Press, New York.

Scheufele, D.A. *et al*. (2008), *Religious Beliefs and Public Attitudes toward Nanotechnology in Europe and the United States*, in «Nature Nanotechnology», vol. 4, n. 2, pp. 91-94.

Schlinger, H.D. (2009), *Theory of Mind: An Overview and Behavioral Perspective*, in «The Psychological Record», vol. 59, n. 3, pp. 435-448.

Schmidt, K. (2010), *Göbekli Tepe – The Stone Age Sanctuaries: New Results of Ongoing Excavations with a Special Focus on Sculptures and High Reliefs*, in «Documenta praehistorica», vol. 37, n. 17, pp. 239-256.

Shanks, N. (2004), *God, the Devil, and Darwin: A Critique of Intelligent Design Theory*, Oxford University Press, Oxford and New York.

Shaw, A. (2002), *It Just Goes Against the Grain. Public Understandings of Genetically Modified (GM) Food in the UK*, in «Public Understanding of Science», vol. 11, n. 3, pp. 273-291.

Silver, L.M. (1998), *Remaking Eden: How Genetic Engineering and Cloning Will Transform the American Family*, Harper Perennial, New York.

Silver, L.M. (2006), *Challenging Nature: The Clash Between Biotechnology and Spirituality*, Harper Perennial, New York.

Spadafora, D. (1990), *The Idea of Progress in Eighteenth Century Britain*, Yale University Press, New Haven and London.

Sutrop, U. (2001), *Umwelt - Word and Concept: Two Hundred Years of Semantic Change*, in «Semiotica», vol. 134, n. 1/4, pp. 447-462.

Thibodeau, P.H. and Boroditsky, L. (2011), *Metaphors We Think With: The Role of Metaphor in Reasoning*, in «PLoS ONE», vol. 6, n. 2, e16782.

Thilly, F. (1965), *A History of Philosophy*, third ed., revised by L. Wood, Holt, Rinehart and Winston, New York.

Tylor, E.B. (1871), *Primitive Culture: Researches into the Development of Mythology, Philosophy, Religion, Language, Art, and Custom*, Brentano's, New York.

Venter, C. (2013), *Life at the Speed of Light: From the Double Helix to the Dawn of Digital Life* (2013), Viking Adult, New York.

Verplaetse, J. (2011), *Zonder Vrije Wil: Een Filosofisch Essay over Verantwoordelijkheid*, Nieuwezijds, Amsterdam.

Weart, S.R. (1988), *Nuclear Fear: A History of Images*, Harvard University Press, Cambridge, Mass.

Wellman, H.M. (1990), *The Child's Theory of Mind*, MIT Press, Cambridge, Mass.

Williams, M. (2002), *Deforesting the Earth: From Prehistory to Global Crisis*, second, annotated ed., University of Chicago Press, Chicago.

Williams, R. (1983), *Keywords: A Vocabulary of Culture and Society*, Flamingo/Fontana, London.

Wrangham, R. (2009), *Catching Fire: How Cooking Made Us Human*, Basic Books, New York.

Young, R.W. (2003), *Evolution of the Human Hand: The Role of Throwing and Clubbing*, in «Journal of Anatomy», vol. 202, n.1, pp. 165-174.

Zalasiewicz, J. *et al*. (2011), *The Anthropocene: A New Epoch of Geological Time?*, in «Philosophical Transactions of the Royal Society A», vol. 369, n. 1938, pp. 835-841.

Abstract

Metaphors are inevitable core elements of the conceptual schemes that shape our thinking and behavior. Traditionally, nature is interpreted in terms of agential metaphors such as ghosts, gods, witches and angels. Science, in contrast, is characterized by contra-intuitive, mechanistic thinking and machine metaphors. Modern societies nevertheless remain, to a certain extent, in the grip of powerful agential tropes. It will be argued that they are one of the obstacles that stand in the way of both reaping the full benefits of modern science and of meeting two of the biggest challenges we have ever faced: overpopulation and climate change. Or, put differrently, they are one of the reasons why there is a problematic mismatch between our modern "Umwelt" *and "niche".*

Edizioni ETS
Piazza Carrara, 16-19, I-56126 Pisa
info@edizioniets.com - www.edizioniets.com
Finito di stampare nel mese di giugno 2014