The Environment and Its Ontological Status

SALVATORE ITALIA

Department of Education, Psychology and Philosophy. University of Cagliari
Via Is Mirrionis 1. 09123 – Cagliari. Sardinia. Italy
salvatore.italian29k@gmail.com

ABSTRACT: Is reality a 'Ready-Made World' or an entity constructed by individuals and social activity? The concept of the environment seems to be the boundary that clearly shows how we can simultaneously adhere to our apparently contradictory intuitions—that is, those about the external and autonomous features of reality independent of human intervention, and those about its undeniably constructed character. The environment, then, seems to be a concept that shows how non-epistemic and epistemic notions of reality (i.e. respectively seeing reality as independent from and dependent on us) can be understood cohesively.

KEYWORDS: Affordances – environment – niche construction – natural selection – realism.

1. Realism, 'dependence', and 'independence'

During our daily activities, when we walk, play football, or talk to a friend about various facts and events—about their *truth*—we refer to a reality that we assume to be independent. The shift from the concept of truth to that of reality occurs naturally because we talk about what is real by discussing what is true, and we trust our truths because they are supposed to refer to autonomous states of affairs. However, our intuitions about the descriptive and 'correspondentist' aspects of truth (that the objectivity of truth is linked to the idea of an autonomous and independent reality yet to be described) must be

balanced with another important and natural intuition: the need to conceive of truth as potentially revisable (the view known as 'fallibilism').[1] As finite beings, we cannot exclude the possibility that an assertion or a belief, even if justified now, could turn out to be false at some point in the future, since we have many examples in the history of science that support the idea that 'truth' can be revised.

These two characteristics of the concept of truth shed light on the features of our intuitive understanding of reality. We conceive of our truths as *constituting* reality (through what is real *for u*s) and, at the same time, our truths play valuable roles in our daily lives (in both practical and theoretical activities) given that we also conceive of them as *corresponding t*o reality. Thus, truth has an adaptive role (cf. Wuketitis 1999). We consider our truths to be the most reliable instrument for orienting ourselves (practically and theoretically) in a world that we cannot completely keep under control and that sometimes surprises us. We need to protect ourselves from this element of surprise, as predictability is necessary for projecting and creating some order in our lives. Truths are the basis of this process, as they are essentially linked to predictability. If truths are both (C) *constitutive* and (D) *descriptive* of reality[2]—as respectively endorsing an epistemic and a non-epistemic conception of realism—we obtain a concept of reality that is both constructivist and realist: reality is created by our truths and is simultaneously independent of them.[3]

To be clear, realism is the belief in the independent existence of certain entities. Different kinds of realism depend on the entities that are referred to (here I will refer to that particular entity called the 'environment') and on the degree of independence that is ascribed to them. Moreover, independence is a matter of degree, and we can adhere to either an epistemic realism according to which the limits of reality are the limits of our knowledge (current or possible), or a non-epistemic realism according to which the limits of reality are unknowable (currently or absolutely).[4]

---

[1] Fallibilism is in general defined as the view that it is not inevitable that our beliefs be certain; as such it implies that their truth is not unquestionable.

[2] (C): What turns out to be true shapes our idea of what reality consists of; (D): Something is true because it is supposed to correspond to how things really are.

[3] This also entails the problem of relativism: why our truths and not "theirs" are a better description of reality?

[4] To be sure: *non-epistemicity* too, as well as *epistemicity*, is a matter of degree.

Going back to the relationship between truth and reality, it is important to show that by putting too much emphasis on (C), we could arrive at an uneasy problem, as described by Boghossian:

> The world did not begin with us humans; many facts about it obtained before we did. How then could we have constructed them? For example, according to our best theory of the world, there were mountains on earth well before there were humans. How, then, could we be said to have constructed the *fact* that there are mountains on earth? (Boghossian 2006, 26)

This explains that constructivism could and should be balanced with realism: we can construct our concepts, but not the properties they are supposed to refer to; we can construct descriptions but not 'things' or facts. Is that true? There are different degrees of constructivism: according to the most extreme version all kind of entities are formed by individual and social activity; according to the softer type, only a subclass of entities is constructed (like language or social institutions). Referring to environment, I hold the thesis that 'our' environment is constructed, but not entirely, being it also subjected to pressures and constraints coming from other 'external' realities. The field of ontological positions is broad (metaphysical realism, scientific realism, common sense realism, structural realism, internal realism, external realism). Here I will hold a particular version of external realism where "externality" (and thus independence) comes in degrees. We move pragmatically in a world conceived as:

(1)   independent from us, a feature that is the basis of our truths' *objectivity*, which, in turn, is the basis for our trusting these truths; and

(2)   dependent on our possible intervention, a feature that is the basis of our desire for further knowledge, to the extent that we want to know how things are in order to modify established 'truths' as required.

Before turning to the environment-notion as an exemplary concept that clearly shows how these two aspects of reality can be held together, there is another point worth mentioning. The environment is an entity that is determined to exist based on a particular science (ecology), so the degree of certainty science can provide us is now of utmost importance. Avoiding both scientism and skepticism—the former of which is a way to trust science as

providing us with absolute certainties,[5] and the latter as endorsing an attitude to never trust science because of its unavoidable contextual character—we can pragmatically say that science, even if dependent on contingent and contextual interests and values (as all humans activities are), can give us objective results (or 'truths') to the extent that such truths are of productive value when directly or indirectly tested in reality.[6]

Scientific results cannot be regarded as *absolutely* true because for both their genesis and their acceptance, they depend on assumptions that are assumed within the 'Lifeworld' where they originate (borrowing this concept from Habermas 1999, 32).[7] Thus, science cannot be an absolute explanation of what is and is not, nor can it explain evolution; instead, it can only be understood as a *contextual* absolute explanation. In other words, it is an explanation that has an absolute value only within a given context. This means that we cannot draw the boundaries between what exists and what does not independently of us in any absolute terms, and therefore we cannot define the various parts of a non-epistemic reality in a way that does not feature the limits of our own particular perspective on the reality that we experience.[8] However, we cannot avoid referring to our truths in absolute terms, at least until there are any compelling reasons to give them up. This is simply a pragmatic reaction to scepticism where we trust science *under condition*—that is, under the awareness of both its contextual dependence and its fallibility.

---

[5]   This is an extreme version of scientism, being it the general view that the scientific methods, categories and results achieved in natural sciences are the only elements of reliable inquiries (whether in social sciences or humanities or in philosophy).

[6]   The extreme version of scientism I have been dealing with here can be also defined as an attitude of absolute trust in the power of science and potentially results in having to give up on fallibilism—that is, the awareness that what we hold to be true can turn out to be false someday.

[7]   In Habermas's philosophy, the notion of the 'Lifeworld' refers to an already-interpreted world in which we move as speakers and actors, made up of a 'background of widespread beliefs' and characterised by 'naive familiarity' and inescapability (see Habermas 1981, II, 199-201).

[8]   As anticipated above, a non-epistemic conception of reality tends to separate truth from what it is possible to know about it. On the other hand, an epistemic conception of reality sees it as being made up of truths, putting emphasis on the link between truths and our epistemic possibilities (justifications).

After this preamble, aimed at avoiding the accusation of scientific foundationalism, the concept of the environment, interpreted as the limited realm of potential actions for *each* living species can be reintroduced (cf. Sanders 1997, 108). As I will make clear with the idea of 'niche construction', this environment's independence is only *partial* because, on the one hand, it depends on the constraints imposed by other environments (independence) and, on the other hand, it depends on our cultural or ecological intervention (dependence). It is accurate to say that we are animals moving within a reality that we share with other species and whose existence—together with the existence of chemical substances—does not depend on us. Even if *what* these substances are is described by science, the *existence* of these substances does not depend on the existence of science.[9] By considering the various determinants of existence, we arrive at the idea of the 'unity of the universe, to which humans belong as natural creatures' (Habermas 2007, 40-41). Reflection on this fact leads us to think of humans as being part of a reality that was already *out there before* the birth of human species, and that will continue to survive in the case of the disappearance of human beings. So even if we deal with a reality that is somehow made by us (environment) we also *indirectly* deal with other less depending realities.

How do we conceive of this external reality? Does it affect our own life constraints, or must we instead conceive of such constraints as depending strictly upon us? Constructivism emphasises the responsibility of human beings in creating their own reality, forgetting that not all of the constraints we encounter are easily met (see von Glaserfeld 1981). In contrast, metaphysical realism does not take into account the constructive role of human beings in building their own reality. In fact, according to metaphysical realism, there is a 'Ready-Made World', or an absolute reality that our knowledge must correspond to in order to be true; this can only be achieved if we are able to obtain a God's Eye Point of View where it is possible to describe reality in its actual form, thus developing a 'unique true theory' (cf. Putnam 1982).

The problems here are with the idea of a unique (absolutely) true description according to scientism, or the idea of a fixed and eternal 'Ready-Made World' and the presumption of accessing a God's Eye Point of View from a human context. In a nutshell, we could never be sure to have achieved this

---

[9]   For instance, one could ask whether or not salt was sodium chloride before the introduction of chemistry (cf. Marconi 2007, 64).

God's Eye Point of View even if we actually had it. It seems as though the answer lies in acknowledging both answers to the question, and that arguing for the presence of an external reality that influences the features of our own 'reality', together with the influence of the individual's own construction, paint the most accurate picture of what reality itself actually consists of. There is of course an interplay between external and internal factors in characterizing what we usually call 'reality'.

In the present essay, I will show how this interplay works in determining the reality of our 'environment'. In fact, it seems to me that evolutionary biology and ecological psychology—relying on the notions of 'niche construction' and 'affordances', respectively—lead us on the right path in the argument for an external reality (not completely constructed) that stripped of all of the baggage usually associated with metaphysical realism.

2. Realism of niche construction and affordances

A preliminary step in the argument requires that a definition of both niche construction and affordances be provided. These two concepts shed light on both the dependent and independent aspects of the environment. External reality can be thought of as the framework for all human epistemic activities, consisting of the indefinite totality of all *ecological relations* between organisms and their environments, meaning that the 'products, resources, and habitats that […] organisms construct […] constitute fundamental components of their world and those of other species' (Day, Laland & Odling-Smee 2003, 87). We can consider these relations as *affordances*, defined as 'relations between abilities of the organisms and features of the environment' (Chemero 2003, 189). This concept was first introduced by J. J. Gibson (cf. Gibson 1979), who defined an affordance in terms of what the environment offers to an animal as a possibility, either good or bad: for example, 'for humans the ground is walk-on-able, chairs are sit-on-able, water affords drinking and so on' (Withagen & Wermeskerken 2010, 490).[10] However, the vagueness implicit in this first definition has made it possible for other accounts of affordances to be proffered,

---

[10] 'The meaning or value of a thing consists of what it affords' (Gibson 1982, 407). It is possible to talk about 'positive' and 'negative' affordances (see Kono 2009, 358). For other definitions of affordances, see Chemero (2003, 184-190).

among which I find Chemero's to be one of the most appealing. Defining af-fordances in terms of 'dynamic relationships' has the advantage of avoiding the question of how they could have existed before the animals, because it leads us to consider the environment as not having existed before the animals, but instead as being deeply linked to them. In other words, 'animals and their environments evolve together, and animal's alteration of the environment has a constitutive role in this co-evolution' (Withagen & Wermeskerken 2010, 497).

This alteration of the environment caused by animal activity is the so-called niche construction, the process which includes birds, ants, and spiders con-structing nests, and humans (for whom cultural activities play a major role) creating houses (Withagen & Wermeskerken 2010, 499).[11] Laland, Odling-Smee & Feldman (2000) have discussed two ways in which organisms can operate in their environments: 'perturbation' (through which they change com-ponents of their environment, such as chemicals, resources, or artefacts) and 'relocation' (when they move within an environment's space, or from one en-vironment to another). As a clear example of the first, forests 'contribute to the hydrological cycle, through the retention and evapotranspiration of water, and by doing so they may affect their own weather' (Day, Laland & Odling-Smee 2003, 85), whereas an example of the second is when animals select habitats for annual or seasonal migrations.[12] If the notion of affordance shows that the environment constrains the possibility of action (which is a fundamental point in support of metaphysical realism), the concept of niche construction can re-solve this concern by showing that animals can change their own environ-ments—in other words, they can modify what their environments 'afford' them (thus consistent with the requirements of constructivism).

An example of how niche construction counteracts the environment's nat-ural selection process can be shown through the study of Lill & Marquis (2003), where they describe how *Pseudotelphusa* caterpillars build leaf shel-ters which in effect constitute environments for *other* insects to colonise. How-ever, the classic (and maybe clearest) example of how environment is strictly dependent upon an organism's life is Charles Darwin's study of the earth-worm's impact on the landscape (cf. Darwin 1881; Ghilarov 1983). Darwin

---

[11]   Niche construction theory is usually associated with the name of Richard Lewontin, who presented its first formulation in 1983.

[12]   Perturbatory niche construction, too, is more visible in animals (cf. Day, Laland & Odling-Smee 2003, 85).

aimed to show how 'earthworms and the vegetable mould surrounding them have co-evolved. Vegetable mould did not exist before earthworms. Their relation is *mutual*' (Costall 2001, 478).[13] In particular:

> [W]orms, through the creation of vegetable mould, are responsible for changing the structure and chemistry of the topsoil. And this has profound effects on the ecosystem. As every gardener knows, vegetable mould provides a rich structural basis from which to grow plants. However, the change in the topsoil has implications also for the worms themselves. Initially, worms were structurally not very well adapted to the topsoil. Indeed, their epidermis is very sensitive and needs to be kept warm and wet. They are better suited to live in water than in the soil. However, by changing the chemical composition of the soil, digging burrows and dragging leaves in, earthworms created an environment that better suits their physiological make-up. (Withagen & Wermeskerken 2010, 500)

We now seem to be back at the starting point: does a truly independent reality exist or not? I want to stress that affordances and niche constructions are two concepts that make it possible for us to see more deeply within the structure of the particular reality called the environment. Even if an environment does not exist before the animals living within it come into being, it is only *partially* unavailable to them in a sense that I am now going to explain. Through this kind of partial unavailability, the environment puts us on the right path to find a *minimally* independent reality (still unable to meet the requirements of the strongest realists) because even if, on the one hand, reality undergoes all of the changes that we, as living species, bring to our environment (niche constructions), on the other hand, it imposes constraints upon us that do not depend on our natural selection, instead depending on:

  (a) what we have brought to life (and what we face now in life as an autonomous reality);

---

[13] Because most of the effects of niche construction are long-term ones (on scales ranging from the extremely local to the global), it is possible to speak of an 'ecological inheritance' (Laland & O'Brien 2012, 192). For example, the worms' offspring will inherit 'not only genes […] but also an environment that better suits their epidermis' (Withagen & Wermeskerken 2010, 501). Withagen & Wermeskerken (2010, 505) see ecological inheritance as an inheritance of affordances.

(b) what we have not changed (because we are still unable to change it or because it was not a priority for us to change);

(c) what other species do in their own environments.

It is thus clear that through niche construction, living organisms 're-script the pattern of natural selection' so that 'adaptation (adaptative complementarity) results from two processes (selection and construction), not one' (Laland & O'Brien 2012, 195). The environment of a particular species is made up of the sum of all of *its* affordances, which together determine the realm of all intentions that can be satisfied at a given place and time, and since affordances (and thus environments) do not exist before their species, it follows that if a species disappears, the affordances linked to it vanish as well.[14] This result leads us to consider the difference between the environment and the external reality, the first being is a product of particular affordances: the environment is made up of all of the affordances that are related to it, whereas external reality is made up of all of the existing affordances related to different environments. In other words, considering that the latter is the sum of all affordances (also made of affordances that do not depend on us but on other organisms whose existence is independent from us), it can also be conceived of as the sum of all the environments.

Affordances owe their own existence to the presence of a species able to perceive and exploit them, while their exploitability also depends on the presence of an intention (see Stoffregen 2003, 125-126).[15] However, animals can alter the environment 'in order to change what it affords them' (Kono 2009, 366), i.e. to adapt it to their intentions. In the case of humans, this niche construction occurs mostly through the use of language as a powerful instrument of change. In fact, it is language (and, more generally, communication) that

---

[14] Conceiving environment in terms of affordances makes it possible to explain not only what is relevant to a species but also why it is relevant (cf. Withagen & Wermeskerken 2010, 505).

[15] Chemero conceives of affordances as a *primitive* way of perceiving the environment, as a 'feature placing' mechanism: the difference between this kind of perception and the perception of an object is explained as being the difference between 'realizing that your car is dented' and 'realizing that it is raining' (Chemero 2003, 185). We can consider an affordance as an *emergent* property because since 'it is a conjunction of a property of the environment and a property of the animal, the actualization of the affordance is a property of the animal-environment system' (Stoffregen 2003, 122).

allows us to develop such a complex culture—one that is able to feed back to nature with the ultimate aim to change it according to our needs and desires, such that it is communicatively shaped and stabilised. When affordances do not allow us to realise an intention, we begin to think about different solutions to realise our goals. We may want to find even more effective ways to realise them. Through evolution, we have developed cooperative attitudes, finding that sociality makes things easier (based on our needs of survival). An example here is the division of labour that allows us to increase production in order to have more free time. A necessary requirement for this complex development is communication. Here, subjects exploit their society, and at the same time are oppressed by it, but language is the medium through which they can both influence and be influenced via the set of affordances that their particular society allows them. In other words, we can say that human niche construction operates mostly through culture—that is, through sociality and communication. In light of this, affordances are the means by which a connection is established between cultural and linguistic human activity and external reality.

This last dimension reveals the external reality's *unavailability* when it does not allow some change to happen (at least at the present time). This shows resistance from a dimension that does not depend on us: that is, what exists prior to a constructed environment, or the indefinite set of *other* animal-environment relationships that together constitute the reality in its not-constructed level (as a sum of other environmental relationships). Such a context is both *absolute* (from the point of view of the existence of a species) and *relative* (because externality is always perspectival with respect to the species' points of view within the considered time frame). The environment has a connection to an external reality, characterised by many environments that undergo changes due to both external and internal factors, such as the presence of other environments and the niche construction processes. These environments can possibly modify selection pressures (at least certain kinds).

This ecological approach to realism that I have shown here seems to be the way to avoid the risks of: (1) metaphysical realism; and (2) constructivism. In fact, regarding (1), my idea is consistent with the view that the environment is 'evolutionist without being selectionist' (cf. Chemero 2003, 190), as it is inconsistent with Reed's 'environmental determinism' (see Costall 2001, 478) where the environment, as an independent variable (or a Ready-Made World),

gives us a set of possibilities (or an ecological niche) to which we must conform in an adaptative way.[16] This traditional selectionist view, best captured in the metaphor of adaptation, forgets that animals' 'utilization, destruction and creation of affordances are central elements in evolutionary dynamics' so that 'animals do not evolve so as to fit in a pre-existing environment' (Withagen & Wemeskerken 2010, 489-490). As a result of these limitations, I have provided here a different and non-selectionist way to conceive of the environment.

Finally, regarding (2), the reason why this kind of constructive process cannot be conceived of in a strong constructivist way (anti-realism) is that 'niche construction *can* alter the evolutionary process', but it has to confront itself with constraints that can (or cannot) allow for such changes: 'Changes in the affordance layout are not exclusively the result of animal activity. Indeed […] geological and hydrological processes can also alter the affordances in an animal habitat' (Withagen & Wemeskerken 2010, 503). For example, 'A volcanic eruption can change the context of selection of many species in a certain habitat' (Withagen & Wemeskerken 2010, 502). In addition, 'niche-constructing organisms may also influence the evolution of other populations' (Day, Laland & Odling-Smee 2003, 90). For instance, forests can alter the weather, weather in general can influence the development of other plants, and 'organisms can pump abiota into physical states that the abiota could never reach on a dead planet, and these modified abiotic components of ecosystems may later become the source of modified natural selection pressures acting on other species' (Day, Laland & Odling-Smee 2003, 90).[17] There is more: the environmental change that results from niche construction feeds back again into the

---

[16]   Reed (1996) presents a selectionist view of affordances, according to which they, as resources, exist prior to the animals, while Withagen & Wemeskerken opt rather for a conception which is more committed to niche construction theory. The fact that affordances extert some selection pressure does not mean that we cannot operate on them.

[17]   This phenomenon is known as 'ecosystem engineering'—that is, organisms' creation, destruction, or modification of habitats and/or modulation of the availability of resources to other species (see Jones, Lawton & Shachak 1994). A necessary requirement for making this possible is the presence of 'engineering webs'—connective webs in ecosystems—which are caused by species' influencing energy and mass flows and which create habitats and other resources for other species (cf. Jones, Lawton & Shachak 1994). For such definitions see Odling-Smee, Erwin, Palkovacs, Feldman & Laland (2013). Abiota are non-living factors influencing the characteristics of an ecosystem.

constructive population as a modified source of natural selection that is there-fore *independent*. For example:

> [T]he construction of villages, towns and cities creates new health hazards as-sociated with large-scale human aggregation, such as the spread of epidemics. Humans may respond to this novel selection pressure either through cultural evolution […] constructing hospitals and developing medicines and vaccines or, at the ontogenetic level, developing antibodies that confer some immunity or through biological evolution, with the selection of resistant genotypes. (La-land & O'Brien 2012, 198)

Using the vocabulary of affordances, it is possible to say that 'affordances not only form the context of selection that animals *encounter*; by creating and de-stroying affordances, animals also *construct* this context and thereby affect the evolutionary dynamics' (Withagen & Wemeskerken 2010, 504).

In considering the idea that some external constraints can influence the niche construction process, the concept of the environment that I have provided displays a kind of realism (about an entity called the 'environment') that is both epistemic and non-epistemic because it lead us to think about different reali-ties, some of which are independent both in their existence and in the con-straints they put on us (*gradual* realism).[18] This provides us with an idea of how these two different ideas can coexist, provided that we conceive of 'non-epistemic' in the minimal and external sense of a limit that can (or cannot) influence our epistemic processes, but whose reality still exists outside of them (even if it is not completely independent).

It is the very presence a non-epistemic dimension that makes my model different from Wuketitis'. He correctly acknowledges that adaptationist ap-proaches in evolutionary epistemology (see Vollmer 1975; 1984) do not con-sider the fact that what is out there exerting pressure for natural selection is also a product. In other words, organisms are not a mere product of their sur-roundings, passively shaped by natural selection pressures. They also posi-tively respond to these pressures, by changing them and creating new and dif-ferent pressures. This is what a non-adaptionist approach affirms (cf. Wuketitis

---

[18] I speak of *gradual* realism to highlight that not all realities depend on us to the same extent. In fact, environment is more modifiable than external reality: both are indepen-dent, even if in different degree.

1989).[19] Along these lines, Wuketitis develops a *functional* realism that, in my view, ignores the role of the non-epistemic dimension. He stresses the species' own world as being the product of a dynamic and interactive process, but this same world also undergoes changes and constraints from within the external dimension: the external reality (as I define it). This notion is not without use (as is claimed in Wuketitis 1999, 30), to the extent that it exerts a very specific role (a negative one) on our own environment.

3. Conclusion

Epistemic processes (the example here is the niche construction process) are both free and constrained (natural selection). We move within a framework of different degrees of reality, some more dependent upon us than others. The case of the environment clearly illustrates the presence of different realities, and in particular, the nature-universe (or external reality), which is more independent (even if it undergoes indirect revisions from all the environments that, together, constitute it), and the environment itself, which is more dependent on our niche construction processes. So, affordances still undergo the limits that our environment inherits from an external reality; this explains why not all intentions can be satisfied. However, their unavailability is not absolute; affordances can change for both internal and external reasons, i.e., because of our niche construction processes and for external non-epistemic reasons (e.g., other species' processes).

To conclude, what is realist, in the concept of environment, is its working as a reality that allows or not allows our intentions to be satisfied; what is anti-realist, is that through the niche construction processes we can modify our environment.

References

BOGHOSSIAN, P. (2006): *Fear of Knowledge. Against Relativism and Constructivism.* Oxford: Oxford University Press.

---

[19] He does not cut off the presence of an external reality to which organisms adapt; he simply tries to balance its weight, with respect to the constructive role of organisms. A nonadaptionist approach is not *anti*adaptionist (see Wuketitis 2005).

CHEMERO, A. (2003): An Outline of a Theory of Affordances. *Ecological Psychology* 15, No. 2, 181-195.

COSTALL, A. (2001): Darwin, Ecological Psychology, and the Principle of Animal Environment Mutuality. *Psyke & Logos* 22, No. 2, 473-484.

DARWIN, CH. (1881): *The Formation of Vegetable Mould, through the Action of Worms with Observations on their Habits*. London: John Murray.

DAY, R. L., LALAND, K. N. & ODLING-SMEE, J. (2003): Rethinking Adaptation: The Niche-construction Perspective. *Perspectives in Biology and Medicine* 46, No. 1, 80-95.

GHILAROV, M. S. (1983): Darwin's Formation of Vegetable Mould – its Philosophical Basis. In: Satchell, J. E. (ed.): *Earthworms Ecology: From Darwin to Vermiculture*. London: Chapman and Hall, 1-4.

GIBSON, J. J. (1979): *The Ecological Approach to Visual Perception*. Boston: Houghton Mifflin.

GIBSON, J. J. (1982): Notes on Affordances. In: Reed, E. & Jones, R. (eds): *Reasons for Realism: The Selected Essays of James J. Gibson*. Hillsdale: Erlbaum, 401-418.

JONES, C. G., LAWTON, J. H. & SHACHAK, M. (1994): Organisms as Ecosystem Engineers. *Oikos* 69, No. 3, 373-386.

KONO, T. (2009): Social Affordances and the Possibility of Ecological Linguistics. *Integrative Psychological and Behavioral Science* 43, No. 4, 356-373.

LALAND, K. N. & O'BRIEN M. J. (2012): Cultural Niche Construction: An Introduction. *Biological Theory* 6, No. 3, 191-202.

LEWONTIN, R. (1983): *Gene, Organism and Environment*. In: Bendall, D. (ed.): *Evolution from Molecules to Men*, Cambridge: Cambridge University Press, 273-285.

LILL, J. T. & MARQUIS, R. (2003): Ecosystem Engineering by Caterpillars Increases Insect Herbivore Diversity on White Oak. *Ecology* 84, No. 3, 682-690.

HABERMAS, J. (1981): *Theorie des kommunikativen Handelns*, I-II. Frankfurt am Main: Suhrkamp.

HABERMAS, J. (1999): *Wahrheit und Rechtfertigung. Philosophische Aufsätze*. Frankfurt am Main: Suhrkamp.

HABERMAS, J. (2007): The Language Game of Responsible Agency and the Problem of Free Will. How Can Epistemic Dualism Be Reconciled with Ontological Monism? *Philosophical Explorations: An International Journal for the Philosophy of Mind and Action* 10, No. 1, 13-50.

MARCONI, D. (2007): *Per la verità. Relativismo e filosofia.* Torino: Einaudi.

ODLING-SMEE, J., ERWIN, D. H., PALKOVACS, E. P., FELDMAN, M. W. & LALAND, K. N. (2013): Niche Construction Theory: A Practical Guide for Ecologists. *The Quarterly Review of Biology* 88, No. 1, 3-28.

PUTNAM, H. (1982): Why There Isn't a Ready Made World. *Synthese* 51, No. 2, 141-167.

R EED, E. S. (1996): *Encountering the World*. New York: Oxford University Press.

S ANDERS, J. T. (1997): An Ontology of Affordances. *Ecological Psychology* 9, No. 1, 97-112.

S TOFFREGEN, T. A. (2003): Affordances as Properties of the Animal-Environment System. *Ecological Psychology* 15, No. 2, 115-134.

V OLLMER, G. (1975): *Evolutionäre Erkenntnistheorie*. Stuttgart: Hirzel.

V OLLMER, G. (1984): Mesocosm and Objective Knowledge – on Problems Solved by Evolutionary Epistemology. In: Wuketits, F. M. (ed.): *Concepts and Approaches in Evolutionary Epistemology: Towards an Evolutionary Theory of Knowledge*. Dordrecht: Reidel, 69-121.

VON G LASERFLED, E. (1981): Einführung in der Radikaler Konstruktivismus. In: Watzlawick, P. (ed.): *Die erfundene Wirklichkeit*. München: Piper & Co., 16-38.

W ITHAGEN, R. & W ERMESKERKEN M. V. (2010): The Role of Affordances in the Evolutionary Process Reconsidered: A Niche Construction Perspective. *Theory Psychology* 20, No. 4, 489-510.

W UKETITIS, F. M. (1989): Cognition: A Non-adaptationist View. *La Nuova Critica* 9-10, 5-15.

W UKETITIS, F. M. (1999): Functional Realism. In: Carsetti, E. (ed.): *Functional Models of Cognition*, Dordrecht: Kluwer Academic Publisher, 27-38.

W UKETITIS, F. M. (2005): Evolutionary Epistemology: The Nonadaptationist Approach. In: Gontier, N., van Bendegem, J. P. & Aerts, D. (eds.): *Evolutionary Epistemology, Language, and Culture*. Dordrecht: Springer, 33-46.