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Towards the Phenomenology of Hybrids as Regenerative Design and Use – A Post-Heideggerian Account

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ABSTRACT

Grasping the identity of hybrids, that is beings which cross the binarism of nature and technology (e.g. genetically-modified organisms (GMOs), syn-bio inventions, biomimetic projects), is problematic since it is still guided by self-evident dualistic categories, either as artefacts or as natural entities. To move beyond the limitations of such a one-sided understanding of hybrids, we suggest turning towards the categories of affordances and the juxtaposition of needs and patterns of proper use, as inspired by the Heideggerian version of phenomenology. Drawing upon selected concepts by Heidegger, we argue that hybrids can be conceptualised as a *regenerative design and use* to serve the planet. We argue that the ideal type of non-exploitative account of hybrids consists of the *adaptive* approach to the environment, which does not, however, exclude the possibility of *designing and constructing* new beings. We also point out that hybrids undermine the divide of being destructive/regenerative which marks the boundaries of nature and technology.

KEYWORDS

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1. INTRODUCTION

Synthetic biological inventions, nanotechnological devices or biomimetic structures, appear to be hybrids insofar as they straddle the boundary between naturalness and artificiality. They constitute a peculiar phenomenon, which, on the one hand, does not have a counterpart in the past, and on the other, is expected to develop intensively in the coming decades. The problem is that our understanding of such phenomena as cell factories or bio-hybrid organisms is still guided by self-evident dualistic categories, i.e., either as artefacts or as natural entities, and the normative approaches related to them. Traditionally, artefacts are assessed rather negatively in terms of their environmental impact and hybrids often seem to inherit such a perception too. Instead, we shall argue that we can lay out the idea of regenerative design and the use of hybrids that go beyond purely human interests and serve the need for the regeneration of the planet. This enables us to revisit the framing of synthetic biology or bio-technological innovations, move beyond their conceptualisation as means of exploitation and provide an alternative understanding of such hybrids as beneficial for the ecosystem.

To develop the regenerative account of hybrids, in the wake of the fall of the traditional dichotomy between nature and technology, referring to phenomenology may be of help as it aims to avoid any ontological prejudices. Specifically, Martin Heidegger's contribution to phenomenology might turn out to be both fruitful and illustrative. Heidegger challenged the dichotomy between natural and artefactual entities in his discussion with Aristotle in search of what is the most 'own' in each of these beings. These efforts to move beyond the nature–artefact divide were followed by his insights into the revisited problem of usability and dwelling as both preserving and constructing, which, as we seek to show, can open a new perspective on our question.

Referring to Heidegger's phenomenology for conceptualising the status of hybrids has also another advantage. It facilitates detecting parallels between environmental philosophy and the philosophy of technology – both greatly influenced by Heidegger – which often pass unnoticed due to their insufficient dialogue (see Hoły-Łuczaj and Blok 2019). One of such omitted resemblances between them is an impact made by the Aristotelian categorisation of artefacts and nature. After discussing it in the first section, we introduce the alternative account of the relation between nature and technology in section two. We unveil the potential of Heidegger's phenomenology (outlined in section 3) for grasping the identity of hybrids in the sections on the specific sameness of physis and techne (section 4), as well as the ontological meaning of the phenomena of affordances (section 5), broken-whole (section 5), adjustment (section 7) and the twofoldness of dwelling as preserving and constructing (section 8). Those readers who are not particularly into strictly ontological considerations may proceed directly after the section introducing the idea of regenerative

design and use, to the final section in which we outline the implications of our findings for practice.

2. POST-ARISTOTELIAN BINARISM

In order to discuss why it is of essential importance to point out that in hybrids the traditional binarism of nature and artefacts is no longer valid, it is worthwhile to begin by reconstructing this binarism as it seems to be still deeply rooted in the philosophy of technology, philosophy of biology and environmental ethics. Despite having different theoretical backgrounds and orientations, we can detect interesting parallels between them concerning the problem in question.

First, they all refer to Aristotle's views on the difference between artefacts and natural entities. According to him, artefacts (which he defined as 'created things') are not genuine substances (even though they are individual things) because, in contrast to natural beings ('growing things'), they do not have the principle of the origin of the movement in themselves, but in human beings who create them (Coyne 2020; Krohs and Kroes 2009; Lee 1999). Artefacts can in this way be understood as *anthropogenic*: they are designed and produced ('generated') by human beings, and in this sense they are not ontologically independent, as natural beings are.

This claim about ontological independence which distinguishes natural beings from artefacts concerns not only their coming into existence, but also their growth, evolution and maintenance. Natural beings strive to sustain their functional integrity, while artefacts do not – and this is the second characteristic of the dichotomy shared by the three discussed fields. They emphasise that artefacts lack the ability to self-repair and self-maintain, and have no metabolism (Coyne 2020: 45–46; Sandler 2012: 53; Krohs and Kroes 2009: 9–10; Callicott 2005: 189; Lee 1999: 170–172). In short, they cannot regenerate themselves.

Artefacts may therefore seem to be similar to abiotic nature (Lee 1999: 172). There are, however, three basic differences between those two. First, unlike abiotic nature, artefacts are described as secondary to the material from which they were made. For example, a tree is not derivative of wood, but a wooden chair is (see Lee 1999: 49–52).

This translates into the second major difference. Artefacts, in contrast to inanimate natural beings, pose specific environmental threats. Their production requires the exploitation of natural resources, their use pollutes the environment, and their disposal further pollutes and litters the planet (see Hale and McAllister 2020; Stewart and Johnson 2018). That is to say, artefacts are not only incapable of self-regeneration, but they are usually produced at nature's expense. We can imagine a chair made from a tree which was broken by the strong wind, but usually, trees need to be cut down for the production

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of wooden furniture. The production of artefacts from plastics requires the use and processing of natural materials, which is to some degree harmful to the environment. Artefacts' contribution to the well-being of nature is then not neutral, but negative. Obviously, artefacts themselves are not to be blamed for this degradation. It is the human beings performing all those activities related to the production of artefacts who are responsible for those devastating results because artefacts are created for humans' purposes.

This claim leads us to the third difference in question. Artefacts are not only produced *by* human beings but they are also produced *for* human beings, implying that they are not only *anthropogenic* but also *anthropocentric*. That is to say, they have determined functions, which are always related to human purposes. Abiotic nature, ranging from the mountain outside one's window to the entire biosphere, in turn, cannot be described by a single function nor even by a limited number of functions, as the Earth and its functions remain a *terra incognita* (Blok 2017).

This claim about the different functional status of artificial and natural beings is another parallel between the aforementioned branches of philosophy. The notion of a function occupies an important place in their considerations, insofar as we can speak of biological and technical functions (Schyfter 2012: 218; Krohs and Kroes 2009). However, neither the term biological nor technical function is clearly defined (Weber 2017; Schyfter 2015; Longy 2009). We will therefore briefly consult the three branches of philosophy to identify their understandings of the function of entities.

In the philosophy of biology, a certain ambiguity can be observed. According to the theory of evolution, there are no 'goals' of organisms at all. However, the notion of a function plays an important epistemic role in biology (contrary to physics or geology) explaining the activity of various behaviours (e.g. the famous dance of the honeybees), a process (e.g. glycolysis) or an internal state (e.g. a perceptive state or a sensation such as hunger) (Weber 2017; Schyfter 2015). In this sense, the heart's function is to pump blood to ensure blood circulation in the cardiovascular system (Cummins 1975; Weber 2017). Biological function is then a capability with a purpose.

In the philosophy of technology, the most common conceptualisation of a function of an artefact is that it facilitates or enables performing a certain purposeful activity with a defined goal. For instance, a screwdriver is something used for screw-driving, which defines its identity (Houkes and Vermaas 2009: 123–124; Baker 2009: 9). The central aspect of a function in technology is, however, the purposefulness of an action performed with the help of a given artefact. It can be divided into two stages: one involved in the design of the artefact and another involved in the use of the artefact. It is not a rare case when something is produced to serve a different purpose than it later actually has (Longy 2009; Lawson 2008) – e.g. when instead of sitting on a chair we stand on it to pick something from a high shelf.

The fact that functions of organisms are not deliberately designed, while functions of artefacts are (even though they do not need to be used in that way), is the main distinction between functions in biology and technology. Despite the attempts to develop a general ontological theory of functions applicable to organisms and artefacts (see Schyfter 2015; Houkes and Vermaas 2009), this difference proves to be a major obstacle, as Ulrich Krohs and Peter Kroes (2009) point out.

This difference also translates into their different ethical status. Regardless of whether purposeful structures within which artefacts are placed were established by designers and producers or by users, they are the purposes of human beings (Longy 2009). In the philosophy of biology and environmental ethics, this anthropocentric and anthropogenic determination of the functions of artefacts is decisive in the assessment of their ontological and ethical inferiority when compared to natural entities (Coyne 2020; O'Neill 2002).

This is reflected in the concept of the 'intrinsic' value of natural entities. According to this theory, natural entities act and function for their own sake and not merely as a means to an end for human beings (Coyne 2020; Katz 2018, 1993; Schyfter 2012; Lee 1999). That is to say, natural entities have a virtue of their own as being free from human interference or control (Sandler 2012: 45). In this regard, environmental ethics puts aside such objects as nests or beavers' dams despite the fact that they also fulfil the characteristics of being artefacts (deliberately created structures serving a certain purpose) because they are not *human* artefacts (Holy-Luczaj and Blok 2021), which, as we have discussed, cause the degradation of the environment.

In this view, presented by the mainstream of environmental ethics, artificiality is both something inferior, merely instrumental, and destructive to nature. This is probably one of the reasons why even the most recent scholarship in environmental ethics is concerned with the environment identified with nature, of which artefacts are not a part (see Lie 2021), but rather to which they are a threat.

3. REGENERATIVE DESIGN AND USE – INTRODUCTION

The above view on the destructive and inferior status of artificiality can be challenged, as we will argue, in the case of hybrids, although the reluctance in question seems to be extended directly towards them. Currently, there is a strong tendency to see hybrids as a further intensification of the technological exploitation and industrialisation of the planet. It is claimed that they are yet another means of gaining control over nature merely to increase productivity. This is a common depiction of, for example, synthetic biology innovations (which were, in Christopher Preston's view, the first technology to pose a challenge to the distinction between nature and artefact (Preston 2008: 30)). Some

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scholars claim that they are necessarily entangled in the domination over nature insofar as they transform natural entities into purposeful objects (Coyne 2020; Schyfter 2012).[1] In such view, hybrids are a manifestation of a drive to mastery that stands opposed to a due appreciation of the giftedness of life, including non-human life (Coyne 2020; Schyfter 2012). It is therefore often claimed that they express the attitude of human arrogance (see Brister and Newhouse 2020).

Yet, there are signs of a shift in attitude toward the use of GMOs in the environmental ethics debate, to which we will return in the final section (Preston and Antonsen 2021; Brister and Newhouse 2020). It seems plausible to claim that hybrids started to be perceived through the prism of their potential contribution to the regeneration of the ecosystem. We will refer to it as the 'regenerative design and use' of the hybrids. We can provisionally frame it by saying that *it involves a movement beyond purely human needs, or, narrowly understood, the productive goals of modern technology, toward the sake of the environment itself*.

To illustrate what such a regenerative account can look like, we can refer, on the one hand, to genetically modified coral reefs, which can thrive in warmer temperatures (Brister and Newhouse 2020; Anthony, Bay, Costanza et al. 2017; Palmer 2016) and on the other, biomimetic reefs (Chen et al. 2015), which are human-made structures created to sustain the biodiversity and stop the erosion of the coasts. The rationale behind designing and using both of them is clearly pro-environmental. Even though it includes human-oriented goals (for instance, keeping the land intact for buildings located on the coasts), the motivation is not purely mercantile, as it takes into consideration preserving 1) the sustainability of the ecosystem for which coral reefs play a vital role, as well as 2) non-human species, since coral reefs are the habitat for a significant percentage of the marine biota.

The above examples of two kinds of reefs – genetically modified and biomimetic – which introduce initially the question of the regenerative potential of hybrids, serve yet another purpose. Namely, it is supposed to demonstrate how limiting it is to locate such phenomena within either the sphere of nature or technology if we seek to understand their role in the environment. Such limitation also concerns to some extent the endeavours to conceptualise hybrids by seeing them as 'synergistic' results of two general tendencies in their emergence: technologising (artificialising) nature (GM coral reefs) and naturalising technologies (biomimetic coral reefs) (Hoły-Łuczaj and Blok 2019). Even though it may appear as a step in the good direction, in the sense of abandoning the dualism of nature and technology, it seems to be insufficient in terms of grasping the more original identity of hybrids. Likewise, it appears

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1. Interestingly, Coyne (2020: 44) refers to Ihde's postphenomenology, arguing in what sense technology appropriates the perception of the entire reality, while Shyfter (2012) draws upon Heidegger to understand the identity of synthetic biology as being oppressive toward nature.

inadequate to define them merely in a negative manner (as *neither* nature *nor* technology) and in doing so, still, employ those two categories as the opposite and necessarily inferior or superior to each other.

We argue that the concept of regenerative design and use might be a good lead to go beyond such binarism. We will follow it, seeking to nuance it with the ideas borrowed from Heidegger.

4. WHY HEIDEGGER?

There are two main general reasons why it is worth turning specifically to Heidegger in an attempt to develop the idea of regenerative design. First, Heidegger's ontological concepts are inherently linked to the phenomeno-logical roots of his philosophy. The battle-cry of phenomenology, expressed by its founder, Edmund Husserl, 'Back to the things themselves!' (without any presuppositions), is manifested in Heidegger in the investigation into how the being of beings is related to the semantics of the adjective *eigen* ('own'). His understanding of intentionality – directedness towards some object and disclosing its sense – underlines the reversal of the relation between passiv-ity and activity. Heidegger claims that becoming attentive to things requires curbing our willingness to impose ready categories on them following our judgment, and instead of this, becoming open to things themselves. This can-not be classified as sheer passivity as it requires more effort than relying on some traditional concepts and their oppositions.

His critique of the body/soul binarism can serve as an example. In *Being and Time*, he expresses his scepticism about the attempts to grasp the ownmost of the human being by employing the categories of body and spirit as two sep-arate domains. He claims that we cannot succeed in doing so without pointing to what guarantees that they can constitute unity (Heidegger 1962: 74). This does not mean that he believes that the problem of the body is unimportant, but only that it cannot be approached by contrasting it with the soul (Heidegger 1991a: 99–100; Heidegger 1991b: 79). In accordance with the phenomeno-logical method, we need to get back to the thing itself (in this case, a human being) before we can know whether in fact the body and soul are necessarily something different and separate from each other.

This strategy, as we will show later, is employed in Heidegger's explora-tion of the problem of *physis* and *techne*, which will be the essential starting point for exploring hybrids' identity. But before we will proceed to that, there is another general reason for turning towards Heidegger's ontology. In fact, there are two reasons: he is greatly influential to both philosophy of technol-ogy and environmental philosophy. Even a brief summary of his impact on the philosophy of technology in one paper seems to be overly difficult, so we will point merely to the fact that even philosophers who do not agree with his views

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on technology found those ideas inspirational for developing their own significant projects. Taking into account specifically phenomenological approaches, we can point here to Don Ihde's postphenomenology. Instead of Heidegger's essentialist approach to technology as the paradigm of the entire reality – enframing (*Gestell*) – the pragmatism of Ihde consists of the focus on individual technologies (like a drone, Google Glass, etc.) in practice and how they mediate our experience without drawing essentialist conclusions (Ihde 2010).

It would be equally impossible to recapitulate Heidegger's decades-long impact on environmental philosophy, which is by no means limited to drawing from his critique of technology (Zimmerman 2018). To illustrate this, we can refer here again to the specifically phenomenological movement of eco-phenomenology. It advocates a reorientation of the contemporary paradigm of human–natural world relations by providing alternative ontological categories to conceptualise them. Eco-phenomenology diagnoses as the source of the ecological crisis the assumption, inherited from the history of philosophy (mainly from Plato and Descartes), that human beings are separate from (or above) nature. To deconstruct our ordinary experience, eco-phenomenology emphasises the indivisibility of human beings and the natural environment. Rather than thinking in dichotomous terms, we should instead understand ourselves as being enmeshed in nature. This claim about the interrelationality of beings is accompanied by the assumption that human beings uncover the identity of nonhuman beings, rather than freely create them (Brown and Toadvine 2003: 12–14). Interestingly, Heidegger appears to be one of the key figures for eco-phenomenology (Toadvine 2016; Langer 2003; Thomson 2004: 396; Ennis 2007).

Strangely enough, Heidegger's reception in the philosophy of technology and environmental philosophy was developing to a large extent independently from each other, which resonates with the fact that for a long time the dialogue between environmental philosophy and the philosophy of technology was to a certain extent limited (Hoły-Łuczaj and Blok 2019). This again can be illustrated by the fact that paths of eco-phenomenology and postphenomenology rarely ever crossed.

We intend to *merge* them, in a way, by engaging with selected concepts of Heidegger in an attempt to deepen our understanding of the idea of regenerative design of hybrids. We believe that his philosophy still offers important insights that can *inspire* us to re-evaluate the alleged obviousness of certain dualisms, for instance, this of nature and technology. Thus, we refer to our account as the post-Heideggerian phenomenology of hybrids (see Ihde 2010).

5. SAMENESS OF PHYSIS AND TECHNE

In brief, Heidegger is concerned with *being*, or more precisely with how being is forgotten in the metaphysical tradition: according to him, metaphysics has shifted its interest entirely away from *being* in favour of *beings*. That is to say, the questions posed by metaphysics, like 'What are beings?' or 'What does it mean for beings to be?', are focused on beings and thereby reduce *being* to something self-evident, to the mere presence of objects, ruled by human subjectivity, rather than something in and of itself, worthy of being examined. Heidegger, in turn, introduces the idea of humanity as *Dasein* (being-there), which is not a subject that assesses or judges beings, but is rather oriented towards disclosing: the revealing of the *ownmost* (*eigenste*) of beings.

Heidegger believes that the act of *being* (understood as self-emergence, or the emergence of the sense of a particular being) is not limited to natural beings, but also applies to artefacts. Significantly for us, he discusses this in dialogue with Aristotle's views. In the essay *On the Essence and Concept of Phusis in Aristotle's Physics B*, Heidegger refers to Aristotle's divide between such beings as plants, animals, earth and air, which are contrasted with beings such as bedsteads, robes, shields, wagons, ships and houses. Although Heidegger agrees with such a categorisation, he stresses that we should dismiss derogatory connotations of the term 'created things' and challenge their strict separation from growing things (Heidegger 1998: 191). According to Heidegger, both are ruled by a 'movedness', namely a process of emergence and coming into being. Bedsteads and garments are 'moved' things as well, although that is harder to perceive. Heidegger, however, argues that something which was previously hidden also manifests in them. This can be either their particularity or more generally their self-emergence. Only when a table has been constructed can it be seen as a particular existent table (Heidegger 1998: 192).

This dynamism can be seen as emergence, growth and evolvement towards the disclosure of its being, like a flower emerging and flourishing, which is then common for artefacts, individual things and natural beings. This is the reason why Heidegger claimed that the meaning of *phusis* is narrowed if it is treated only as a contrast with *techne,* which is understood as generating, building and producing (Heidegger 2000: 18). He even sought to clarify 'what is essentially the same in *phusis* and *techne*' (Heidegger 2000: 18; see Hoły-Łuczaj 2018).

Lifting such an opposition is of key significance for the problem of hybrids as it opens up a new way of investigating them. We no longer need to work within the framework of the (alleged) opposition of nature and technology but can look into them anew, being guided by the possibility of discovering what is common for both of them. Again, we can refer in this regard to going beyond the dualism of body and soul in Heidegger. He rejects their opposition but not

the categories themselves. He is rather interested in how they (can) participate in disclosing being by Dasein, given its original unity. So how can hybrids, being either nanotechnological devices, biomimetic buildings or genetically modified organisms, disclose their being – their peculiarity? The answer is quite straightforward: via what they are capable of.

6. NON-SUBORDINATE AFFORDANCE VS. REDUCTIONIST FUNCTION

To explain how the sense of beings emerges to us, Heidegger refers primarily to artefacts. In *Being and Time*, he outlines the structure of being's revelation in reference to the opposition of the presence of an object (being-at-hand, *Vorhandenheit*) and the handiness (being-to-hand, *Zuhandenheit*) of a tool. Heidegger explains that if we merely observe some tool – we look at it as an object that is present at hand – what is most essential to it remains hidden. We can perceive its features such as the material it is made from, its colour, what parts it consists of, etc. However, only when we start to use a tool, its essence is revealed. If I am sitting at my desk and writing this article, my desk, my computer and my chair do not primarily appear as substantial objects in front of me, but as equipment that is useful for writing this article. This is their ontological structure of being 'in-order-to' (Heidegger 1962, 96–98).

Such an account immediately brings to mind the problem of being merely a means, that is something inferior and subordinate to the goals of some other being. But Heidegger's perspective is neither reductionist nor establishing some dominance. For Heidegger, a thing's 'in-order-to' is its 'involvement' (*Bewandtnis* translated also as 'relevance', 'functionality' or 'deployment'). Recently, Mark Wrathall suggested translating it as 'affordance', the term coined by J.J Gibson (Wrathall 2021: 31–32). Wrathall points out that its archaic use, *bewenden,* meant 'to use' or 'to employ' a thing. The prefix *be-* in this case probably connotes 'supplying or endowing'. *Be-wenden*, then, would mean 'to supply or endow or offer something to be used or utilised'. Employment of the passive construction (*bewenden lassen*) indicates that it is the entities in the world that are themselves supplying or offering us their use, so as to open to us the possibility for changing circumstances through our actions. Thus, Wrathall argues, the sense of *Bewandtnis* is very close to that of 'affordance', which indicates the meaning of a thing or organism in the environment that is detected or picked up by the perceiver and allows him to perform a specific kind of action; air affords breathing, a chair affords sitting. Therefore, an affordance is not what we find to be a 'subjective' quality of a thing. But neither is it what we call an 'objective' property of a thing in the understanding that a physical object has no reference to any user. An affordance

cuts through the dichotomy of subjective-objective and helps us to understand its inadequacy (Gibson 1977; Blok 2014).

We have already put forward Gibson's theory as a useful and compatible context for Heidegger's ontology in an earlier contribution (Blok 2014). We can argue that if we think of a tool structure as affordability, its ontological sense can be revealed as a being in relation. Rather than seeing it as a passive and reductionist subordination, we can call it an *interdependency* of the tool's affordance to write, hammer etc. and our human responsiveness to these affordances in our actual engagement in writing or hammering behaviour. The juxtaposition of the Heideggerian handiness of beings understood as tools, as well as the idea of affordances challenging the human vs. non-human binary, enables us to elevate the status of non-human beings. On the one hand, we rely on what non-human beings offer to us for manipulating our circumstances and environment, and on the other, insofar as we activate their affordances, we, in turn, disclose their ownmost being (Blok 2014). Without such an engagement with the entity used, its being cannot be disclosed to us.

As a matter of fact, thinking of hybrids as 'usable things' (*Gebrauchsgegenstände*) specifically in the context of Heidegger's ontology has one more advantage. In German, the word 'use' (*brauchen*) has double meaning: it means not only 'to use' but can also indicate a need (and Heidegger intensively takes the advantage of this ambiguity in his later works regarding the relation of human beings and being (see Bambach 2013; Davis 2007; Kleinberg-Levin 2005; Zimmerman 1990)). When we think of the conceptual space which the notion provides, we can say that the one who uses something is in need of the used thing. This transposes or complicates the relation of dependence: the one who uses a tool like a hammer appears to be dependent on the used thing to be capable of doing something (hammering nails). The latter is not seen as subordinate but rather as helpful, offering some support.

Therefore, the idea of affordance clearly shifts the burden on the used beings as (peculiarly) active in affording us with their potentiality. That is to say, such an account perceives their capabilities as *non-subordinate*. Moreover, the claim that in using some being we disclose something *profound* about this being, does not mean that we *fully* discover its identity. In other words, seeing beings through the prism of their affordances is by no means *reductive*. Heidegger's conceptuality assumes that we are never capable of digging into the very *Abgrund* of beings and exploring them entirely.

This differentiates the ideas of handiness and (modern) functionality. Heidegger is very reluctant towards the latter, as we can infer from his famous interview for the *Spiegel* ('Everything functions. That is exactly what is uncanny…'.). The concept of functionality reduces a given being to a single function, equating, for instance, a river to the source of water power, with the emphasis that human beings are capable of controlling it.

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So when in *Being and Time* we read that 'The forest is a forest of timber, the mountain a quarry of rock, the river is water power, the wind is wind "in the sails"' (Heidegger 1962: 70), this means that natural beings are also 'for something', in the sense that this is the way their being is somewhat disclosed to us. It does not mean that this 'for something' needs to be restricted to providing us with some material or purely mercantile goal. In *Being and Time*, we also find complementary accounts of nature, for instance, the aesthetical one (Heidegger 1962: 70), when nature is, if we can say so, 'something for' to be admired or enjoyed.

The thick concept of the involvement provided by Heidegger enables us to reconsider the status of hybrids. *Instead of asking if they are (more of) nature or technology, it inclines us to answer: What are they for?* In our cases, the response will be: to reduce the environmental costs (biomimetic buildings) and sustain the ecosystem (both biomimetic and GM coral reefs). This can challenge the view that hybrids benefit only human beings as managers of the planet. To go even further beyond the simplicity of the linear, anthropocentric means-ends scheme, it is worth presenting hybrids not merely through what they are for in the sense of 'designed' or 'used' for, but what they are *needed* for. Such a reversal enhances the status of hybrids which are no longer reduced to passive, subordinate objects.

Likewise, (post-)Heideggerian perspective immunises us from the will to reduce the being of the hybrid to its specific involvement. The fact that we discover hybrids in what they are capable of does not require us to believe that their identity can be fully grasped by any of its single affordances (or even by their abstract 'sum'). For instance, it does not preclude that hybrids cannot be something for delighting in their beauty. Biomimetic and GM coral reefs can be praised aesthetically as participating in the awe-inspiring underwater landscape.

7. BROKEN WHOLE

The distinction between handiness (or involvement/affordances) and functionality is not the only useful tool for conceptualising hybrids taken from Heidegger. The other is that of 'enframing' (*Gestell*) and 'equipmental whole' (*Zeugganze*). Heidegger's critique of technology, as we mentioned earlier, is famous for presenting it as enframing that is a paradigm which imposes (or is posing the framework for) a way of thinking literally about everything in specific terms (for instance, becoming more powerful). Every being, or its functioning, is subordinate to achieving such a goal.

In Heidegger, we can find, however, another kind of a 'bigger picture of things' related directly to the problem of use. Namely, he underlines that capturing the precise nature of things in their 'being something for', requires

becoming aware that a single tool is a kind of abstraction. Thinking about the example of a desk, its identity as something to write on presupposes the existence of something to be put on it (a computer or a notebook), something to stand on (the floor), etc. This is how the being of tools always takes the form of an 'equipmental whole' (*Zeugganze*): equipment is always equipment in terms of belonging to other equipment. A desk, in order to reveal its being, must be related to several other things (floor, lamp, computer, etc.) (Heidegger 1988: 163). That is to say, their togetherness is an irreducible moment of the disclosure of their co-constitutive affordances in which their being is disclosed and a world or milieu of writing, for instance, is constituted.

Stating that the phenomenon of use (and need) cannot be extracted from the broader grid of relations in which they are entangled may, however, appear to be a truism. What seems to be less obvious is Heidegger's observation that the disclosure of a tool's being does not happen through simple, undisturbed use. It rather fully discloses itself when it breaks or resists us in some other way (for instance, when a tool is broken or missing) (Heidegger 1962: 102–103). In such a situation, a thing becomes conspicuous and manifests its being. When a tool works smoothly it falls into concealment – it is so handy that we do not (need to) pay any attention to it. It is then a moment of surprise when its being is revealed to us anew in a way we are not *used* to.[2]

Heidegger links the inability of a tool to be used (thanks to which it manifests its being) with that it itself becomes broken. We can, however, seek to combine this insight with the concept of the equipmental whole. *Namely, things cannot be properly used not only when they are out-of-order, but also when the equipmental whole is not working*. For instance, an uneven floor makes sitting on a chair not only uncomfortable but, in fact, also impossible.

The idea of equipmental whole is important for environmental thinking as it enhances the status of interconnections of all beings, their being related to each other, the fact that they need each other and they are mutually dependent. So when a part of it becomes broken, sooner or later, the entire whole becomes broken. This is a moment when we can conceptually fit hybrids into the environment. They are not designed to supersede or refine the existing being but to fix those parts of the ecosystem which are currently broken or missing so that the ecosystem would not collapse or degrade. The introduction of certain hybrids to the environment is then dictated by the intention of repairing some damages or preventing them so that the equipmental whole can still work properly.

However, every intervention in the ecosystem – and the implementation of hybrids is definitely a kind of intervention – will alter it in some way. Thus, we need some kind of measure that can allow us to assess whether some hybrids improve or worsen the condition of the environment. Interestingly, the question of the measure lies at the very heart of Heidegger's concept of proper use.

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2.   It is worth noting that in German, *der Brauch* stands also for 'a custom'.

8. ADJUSTMENT

However, the problem of use, as Heidegger shows us, has one more important angle: that of adjustment. Heidegger develops this idea in his discussion of the proper use (*eigentliche Brauchen*) in his later works, which can be perceived as the continuation of the concept of handiness. According to Heidegger, thanks to proper use, things are capable of disclosing their identity: the proper use 'brings the thing to its essential nature and keeps it there' (Heidegger, 1968: 187). It is proper because it focuses on what is own, proper (*eigen*) to the thing.

Heidegger underlines that proper use is not entangled in the anthropocentric subordination, typically ascribed to this activity. He emphasises that the 'use implies fitting (*anmessende*) the response'. For instance, when we 'handle a thing, our hand must fit itself to the thing' (Heidegger 1968: 187).

By this token, proper use revisits and complicates the relation of activity and passivity in using. The idea of proper use, representing an adaptive approach to things, is oriented at the used thing and the conditions it sets to the user – the goals of the latter, even though they are evidently inscribed in this activity, are not the only factor that decides on the way a given being is used. The activity of the user is not limited to achieving his or her own goals but is also targeted at adapting to a given thing. It requires the one who uses a thing to conform to it: the way it operates, including its internal limitations.

The issue of limitations and fitting to them is directly linked to the question of measure (*Maß*) in Heidegger. We can even say that fitting can be understood as 'measured' (*anmessende*) (see Kleinberg-Levin 2005: 229). It is the measure of the thing itself, which establishes the patterns of becoming adjusted to it. The role of the users (human beings) is to recognise what those patterns are, or the limitations of the thing. Trying to disclose the potential of the used thing we cannot transgress it, because this would result in its destruction. We need to fit into the thing. We cannot employ a too delicate thing for a too demanding task. Unfortunately, many human beings forget this simple rule in their dealings with nature.

The idea of proper use can be even better understood when we see it in stark contrast to exploitation (*Förderung*). Heidegger defines the latter as driving toward the maximum yield at the minimum effort (Heidegger 1977: 15). In other words, it strives to obtain the greatest effect with the minimum care and attention devoted to the thing. In doing so, exploitation does not respond to the thing and its limitations but is solely focused on the goals of the user. Exploitation does not need to be restricted to purely economic or mercantile goals. They can be put in the broader categories of gaining power at the expense of other beings, which are reduced to providing (standing) reserves for it.

So, just as affordances of things are a response to our (human) needs (beings dependent on things), the proper use is our response to the needs of the

planet. We have to keep in mind that we never use just a single tool, we always need to be adjusted to the environment as a whole. The question is, can we (properly) design hybrids which would be responsive, ideally, both to the needs of the planet and to human needs? What are the needs of nature? How can we fit into them and harmonise them with human needs? Can we do it with the hybrids? Before we finally consider this question, we will refer to the last thread from Heidegger which resonates with it: his discussion of two modes of human dwelling as cultivating and constructing things.

9. DWELLING AS PRESERVING AND CONSTRUCTING

The Heideggerian idea of dwelling has played a major role in environmental ethics, as represented for instance in seminal works by Michael Zimmerman (1983; 1986). Dwelling is a vision of the harmonious co-existence with one's surroundings, the world in which human beings feel at home. It is grounded in the sense of belonging and thus stands in opposition to exploitation, conquering and subordination (Heidegger 1971).

What is important for our discussion is that in *Building Dwelling Thinking* Heidegger revisits the link between building and dwelling, arguing they do not fit in the means-end schema (Heidegger 1971). According to Heidegger, the act of building and the way we (should) dwell in the world are so inextricably linked that they together form one phenomenon.

Heidegger, however, reverses the dominating (or modern) account of the direction of their dependency, arguing that the sense of dwelling is more primordial than that of building (Heidegger 1971: 148). That is to say, he claims that only if human beings are capable of getting adapted to the Earth and seek to spare and preserve it (Heidegger 1971: 149), can they properly build on it. It is then a moment of a certain passivity which enables our further activity. Or maybe it is even more complicated than that: we need to first make an effort of becoming ready to learn what the scope is of possibilities of beings to which we are related in our surroundings in order to properly deal with them.

Such dealings (informed by or grounded in the understanding of what is proper to things) are the sense of building. The latter, according to Heidegger, consist of two basic modes: cultivating things and raising them (Heidegger 1971: 151). That is to say, we either nurture growing things or construct new ones, but both co-constitute meaningfully the world. These constructed things are not only buildings but also tools, and pieces of furniture (Heidegger 1971: 151). Importantly, Heidegger speaks here of 'constructing' – 'erecting', 'raising' – and not 'creating'.[3] In doing so, he seems to distance himself from the image of a human being as a creator of things, refraining from associations

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3. We would like to particularly thank one of the reviewers for bringing our attention to that issue in Heidegger.

with the vision of the omnipotent (godlike) agent that is capable of establishing beings *ex nihilo*. Instead, he rather sketches the figure of a modest craftsman making use of what the Earth offers to him.

Heidegger instructs us then that we can preserve (the sense of) the Earth not only by taking care of the already existing (natural) beings but also by constructing new (artificial) ones as long as they correspond to the character of things (Heidegger 1971: 158) or their broader network. In other words, for Heidegger, artefacts also contribute to the way the sense of the world emerges – as in the case of a bridge, which connects river banks. In this connective affordance, it offers many opportunities to human and non-human beings (Heidegger 1971: 153). It does so, however, because its constructors were capable of fitting it into an (equipmental) whole, without demanding too much from them or reducing them to only some selected aspect. The remaining question is: Can hybrids become such (good) things?

10. REGENERATION AS A FITTING RESPONSE

Heidegger lifts the opposition between *physis* and *techne* and instead proposes to re-examine them phenomenologically – that is, to take into consideration how we relate to them (either by using properly or exploiting) and to see the bigger picture of things, namely the equipmental whole. Although Heidegger has obviously never looked into the phenomenon of hybrids, drawing upon his distinctions in what follows, we apply Heidegger's conceptuality to offer a phenomenology of hybrids.

In the case of both types of hybrid coral reefs, genetically modified and biomimetic, we cannot draw a clear boundary between cultivating and constructing. It is rather cultivating *by* constructing: human modifications (i.e. designing something new) serve to preserve the already existing ecosystem. This demonstrates that adapting to the needs of the environment can take the form of anthropogenic, yet non-anthropocentric, intervention.

We adhere to Heidegger's choice of vocabulary and speak of 'constructing' rather than 'creating' hybrids to avoid the aforementioned connotations of the omnipotence of human beings and curb human hubris, which is likely to lurk behind the latter perspective (as it is, for instance, in the concept of geoengineering). In this case wording is, however, of minor importance. At stake is rather the idea that the intervention of human beings does not need to be guided by being privileged to do so, but rather because of it, we owe it to the ecosystem for the devastation which we are responsible for. As recently Clive Hamilton said: 'Our task is not to deny our extraordinary power and attempt to abandon it but to work out how to use our power responsibly, that is, how to deploy technology and management practices to reach a reconciliation, to calm the Earth' (Hamilton 2020: 118).

TOWARDS THE PHENOMENOLOGY OF HYBRIDS

Following this distinction between anthropocentric and non-anthropo-centric intervention in the ecosystem, we can speak of two types of hybrids: regenerative and exploitative. The first ones actively contribute to preserving (cultivating by constructing) or even increasing the biodiversity or improving the condition of the ecosystem. The latter, in turn, may cause deterioration of the ecosystem (as in the case of an aggressive new species) and can be an incentive for the further overconsumption of natural resources.

The idea of regenerative design and use is then oriented not towards *the origin* (coming either from the sphere of nature or technology) of the given hybrid but rather towards its *involvement*, or *affordance*. We argue that this shift in orientation can facilitate the solving of some objections in the debate on hybrids.

Let us consider the case of GM American chestnuts, which was recently discussed by Evelyn Brister and Andre E. Newhouse (2020). American chestnuts were once a dominant species in the forests of the eastern United States, but in the early twentieth century, an imported fungal blight wiped out nearly all of them. A relatively small number of trees remain today – in botanical gardens, where they are protected from the blight – but the fungus is now fully established in eastern US forests, rendering it impossible for an unaltered American Chestnut to be reintroduced to its native range. Researchers at the State University of New York College of Environmental Science and Forestry have therefore developed a transgenic chestnut, which has the ability to create an enzyme that breaks down a toxin produced by the fungus, allowing the tree to survive the infection.

This GM American chestnut is a hybrid insofar as it came into existence through human design and advanced, technological means. This exposes it to the objection that its very existence is a manifestation of human arrogance because humans interfered with nature by manipulating genomes instead of allowing nature to rewild itself (Brister and Newhouse 2020). This objection can be taken even further: human arrogance manifests itself here in the belief that we know what is best for nature (what 'nature's interests' are) and that there could be unforeseen negative consequences that will get out of hand. On the other hand, however, its design and reintroduction (that is use) could have a positive ecological effect on the other environmental actors (pollinators, stream invertebrates, and the wildlife that feeds on nuts (Brister and Newhouse 2020)) as it adapts (responds) to the ecosystem understood as an equipmental whole. This demonstrates that by introducing such a hybrid as the GM chestnut, we are starting to cultivate nature by constructing novel beings, whereby 'cultivating' can be seen as an act of support or preservation. Taking the standpoint of proper use can thus be of help in re-examining the negative stance on GMOs, with the argument that even GM design can support the rewilding of forests (Brister and Newhouse 2020).

The way to handle the problem of collapsing biodiversity is a subject of a still-ongoing debate and we do not aim to settle it. We do not know what the needs of nature are or what kind of biodiversity is needed, given the dynamic nature of nature. We intend to show that introducing hybrids to the ecosystem does not need to be another form of mercantile subordinating of the environment, but rather addressing the need of repairing (human-induced) damages.

Furthermore, it should be devoid of human arrogance in a twofold sense. On the one hand, we cannot see ourselves as the prideful creators of new beings but rather as their humble constructors. On the other hand, we need to acknowledge that we cannot control the unforeseen results of any kind of intervention and that hybrids are definitely a kind of intervention. Thus, we should assess whether possible gains outweigh the possible harmful effects and seek to minimise the risk of the latter.

There is also another perspective on developing hybrids: they can limit the future use of natural resources. Human beings need the latter (for sustenance and building, etc.) but hybrids, in the ideal model we propose, can be designed in a way which will make this use more effective – decreasing the amount of the used natural resources, the waste resulting from it and the environmental pollution. Such a vision is by no means intended to encourage intensified consumption. It does not contradict attempts to convince societies to transform the patterns of the current overconsumption. This argument points to the direction in which the design of hybrids is based on the combination of use (i.e. human needs – human dependence on the environment) and the needs of the planet. We wish to emphasise that the responsibility or responsiveness of hybrids does not have to stop at the purely passive reduction of the use of natural resources; they can and should also be capable of actively contributing to the improvement (cultivating and preserving) of the condition of the ecosystem.

Thus the instance of a normative determination of hybrids should be related to *the environmental cost* of constructing, the later maintenance or use, and post-use managing, as well as the *potential risks* for the biodiversity of a certain hybrid. It should be *lower than the possible ecological benefits* it would offer, varying from decreasing the harmful input resulting from human activity to being a stimulus to rebuild the endangered parts of the ecosystem (acknowledging the dynamic and at the same time the non-designable character of the latter as the integral whole).

That is to say, the hybrid is to be evaluated as 'bad' (endangering, or exploitative) when it is targeted only at the efficiency of yields or industrial production for inducing further (over-) consumption, and as 'good' (cultivating the ecosystem) when it either supports reducing emissions to the environment (without decreasing yields or industrial production (see Blok and Gremmen 2018)) or may become an impulse for recovering some parts of the ecosystem.

These criteria entail then both the way it is *designed* and *used*. Those two aspects always need to be considered when assessing whether some hybrid is

regenerative or exploitative. Even though some hybrids may be designed in a way that is more likely to help rather than to harm the environment, no less important is the way they will actually be used. Speaking in a more phenomenological manner, it is the way we relate to a hybrid which paves the way for its identity to be revealed.

Addressing the question of the role of hybrids in the environment seems to be particularly relevant if we take into account the scale and urgency of the ecological threat we are facing at present. Desperate times call for desperate measures – the rapidity of environmental changes obliges us to re-evaluate the reluctance towards the novel and relatively untested solutions that could allow more sustainability (Brister and Newhouse 2020). Hybrids appear to be just such a novel solution, which may, after all, turn out not to be such a desperate measure.

11. CONCLUSIONS

To understand hybrids and their peculiarity of belonging neither purely to nature nor technology, it is worth viewing them through the phenomenological lens. It enables us to leave the binarism of the spheres of naturality and artificiality, which focuses on *what* hybrids are rather than *how* they reveal their identity. Their identity, or essence, is revealed in their involvement – *the role they serve*, whether it is oriented towards purely economic benefits or the sustainability of the environment. By this token, hybrids can appear in two modes: regenerative (preserving or improving the condition of the ecosystem) or exploitative (worsening it). They can become new means of aiding the planet or gaining further control over it, enabling further exploitation. In other words, they can be either a response to the call of Earth to help regenerate it; or, if used *im*properly (that is transgressing their internal limitations), they will intensify the devastation of the planet.

Our phenomenological discussion of hybrids is informed by selected concepts from Heidegger's ontology. First and foremost, he advocates rethinking the divide between grown/created beings from being focused on their origin to considering instead the way we employ or take care of them. This transposition implies a reduction of human hubris and the drive towards subordination that has become common practice, and encourages us rather to become responsible for – and indeed, responsive to – our surroundings, which we use and need. This goes beyond mere passivity in our relations with the planet, which is highlighted by the non-separateness of dwelling and building (which consists both of cultivating and constructing new things) for Heidegger. This is of particular importance for developing the phenomenology of hybrids.

There is a good chance that the design and construction of hybrids will eventually cease being driven by the urge to master nature (Coyne 2020) and

will instead be in line with 'the ethics of human intervention on behalf of others' (Carter 2020). To support this shift, it will be helpful to approach hybrids with an alternative understanding, different both from the unproblematically pro-technological (ecomodernism) or the counter-technology approach (deep ecology), as we face climate change and our effort to take care of our future becomes imperative.

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