

Open Research Online

The Open University's repository of research publications and other research outputs

The nature of the artificial: augmenting Negrotian artificiality with neo-Whiteheadian naturality

Book Section

How to cite:

Ali, Syed Mustafa (2002). The nature of the artificial: augmenting Negrotian artificiality with neo-Whiteheadian naturality. In: Negrotti, Massimo ed. Nature, Culture & Technology: Methodological Aspects and Cultural Issues. Yearbook of the Artificial (1). Bern: Peter Lang, pp. 25–51.

For guidance on citations see [FAQs](#).

© Not known

Version: Version of Record

Link(s) to article on publisher's website:

<http://www.peterlang.com/index.cfm?event=cmp.ccc.seitenstruktur.detailseiten&seitentyp=produkt&pk=48651&concordeid=76>

Copyright and Moral Rights for the articles on this site are retained by the individual authors and/or other copyright owners. For more information on Open Research Online's data [policy](#) on reuse of materials please consult the policies page.

oro.open.ac.uk

The Nature of The Artificial: Augmenting Negrottian Artificiality with Neo-Whiteheadian Naturality

Syed Mustafa Ali
Computing Department
The Open University, UK

s.m.ali@open.ac.uk

Abstract. In this paper, a theory of the artificial recently proposed by Negrotti (1999a, 1999b, 2001a, 2001b) is critically examined¹. First, a brief overview of this theory is presented. It is then argued that despite the merits of this scheme, principal of which are the self-evident simplicity of its conceptual foundations, its internal consistency (or theoretical coherence), and its possible overall correctness, it is, nonetheless, incomplete. This incompleteness is shown to arise as a direct consequence of the explicit affirmation of a number of problematic metaphysical assumptions about the nature (as essence or what-ness) of nature (as ‘other’ to the artificial). An attempt at resolving the problem of incompleteness by augmenting the Negrottian theory of artificiality with an alternative conception of nature (as ‘other’) grounded in Whiteheadian panexperientialism is made. It is shown that although panexperientialism provides an adequate framework for the conceptualisation of naturality, it does not provide a corresponding framework for artificiality, principally because it fails to adequately characterise the nature (as essence) of artifacts. In order to address this latter problem, it is argued that conventional Whiteheadian panexperientialism must be supplemented with a phenomenological account of artificing that describes the ontologically distinct manner in which artifacts come to be. An attempt at formulating such a ‘neo-Whiteheadian’ account grounded in the metaphysical thinking of Ladrière, Lee, and others is made. In closing, some implications of this alternative Whiteheadian conception of naturality and the attendant neo-Whiteheadian account of artifactuality for the project of “strong” artificiality (that is, the attempt to artifactually replicate natural phenomena) are briefly considered.

1. Introduction

What is meant by the expression *‘the nature of the artificial’*? From an informed yet lay perspective, two answers to this question suggest themselves. First, and perhaps somewhat more intuitively, the expression can be taken to refer to the essence (or what-ness) of the artificial. Second, and perhaps a little more obscurely, it can also be taken to refer to that which stands as ‘other’ to the artificial. From the standpoint of serious philosophical inquiry, however, answers such as those given above merely scratch the surface of the problem, and principally because their very mode of formulation

¹ The most detailed presentation of this theory appears in a work (Negrotti, 1999a) bearing a title that is clearly inspired by that of Herbert Simon’s seminal monograph, *The Sciences of The Artificial* (1969). However, Negrotti’s title is much bolder in that it appears to imply (1) that a single, all-encompassing theory of the artificial is possible, (2) that there is only one such theory possible, and (3) that Negrotti’s theory is such a theory. Granted, for the sake of argument, the validity of (1) and (2), it remains the case that, if the critique presented herein is sound, (3) must be false since, as will be shown in what follows, Negrotti’s theory is incomplete.

necessitates consideration of an indefinite, possibly infinite, number of other issues². For example, what is the *artificial*? Why *the* artificial rather than *an* artificial? Similarly, and granting for the moment that the meaning of *nature* is exhausted by the above two formulations, why *the* nature as opposed to *a* nature? In a related manner, yet with specific reference to the first answer, there is also the need to consider, reflexively, meta-theoretically or otherwise, the meaning of *essence* (or what-ness). Still further, and with reference to the second answer, there is the need to determine precisely what *other-ness* (or, following Levinas, ‘alterity’) means.

Clearly, attempting to address all these issues is beyond the scope of this paper. However, as will be seen in what follows, it is necessary to engage at least some of them in order to fulfil the central objective of this work which is to mount a constructive critique of Negrotti’s theory of the artificial. Principally, in order to provide a contextual platform for such an investigation, it will be necessary to briefly examine what is meant by the term ‘nature’ and it is this issue that will now be addressed.

2. Concepts of Nature

That there are almost as many concepts of nature as there are thinkers who have pondered this issue is a truism³. For example, according to Collingwood (1945), “the Ionian physicists, when they asked the question ‘What is nature?’, at once converted it into the question ‘What are things made of?’” (p.43) For Aristotle, the answer to the latter was always to be given in terms of the respective roles played by matter (or stuff) and form (or structure) in the becoming of a thing (or substance). Furthermore, and consistent with the Platonic view, it is form that is primary⁴; as Collingwood states, it is the notion of nature as ‘principle’ (source or essence) “which we recognise to be its original and, strictly, its proper sense.” Crucially, on his view, this classical perspective contrasts sharply with the modern one that conceives nature simply as “the sum total of natural things.” (p.43) The somewhat problematic (since self-referential) nature of this formulation aside, what is striking is its neutrality with respect to the issue of essence which supports both essentialist and constructivist interpretations of the concept⁵.

According to Soper (1995), “the constructivist speaks of nature as a cultural effect and emphasises the semiotic roles of the concept in mediating access to the reality it names.” (p.312) Although, in radical or “strong” versions of constructivism there is no

² This is true irrespective of whether an ‘analytic’ (that is, logical) or ‘Continental’ (that is, phenomenological) approach to philosophical inquiry is adopted.

³ In this connection, Haila (2000) maintains that “it is not quite obvious whether ‘nature’ has been the same in different cultures except in the abstract sense of being outside each culture, and in the even more abstract sense of being part of the same physical reality.” (pp.163-164) However, this position is readily shown to be problematic from an onto-phenomenological perspective because the externality (that is, ‘being outside’) of nature, interpreted as the ontological *a priority* of the latter relative to human being (Ali 1999), is not something abstract. On the contrary, it is phenomenologically concrete in the sense that it involves the experience of nature as ‘given’.

⁴ According to Lee (1999), “Aristotle maintained that [the pre-Socratics] had failed to distinguish between first matter and second matter. First matter may be said to be primary as ultimate matter, in the absolute sense. For instance the ultimate matter of bronze is probably water. But *Aristotle’s natural philosophy focused instead on second matter* which consists of primary matter and the form or essence, and is the end of all becoming [emphasis added].” (pp.33-34)

⁵ On the former, nature is a given; on the latter, nature – or rather, ‘nature’ - is a human social construct.

reality beyond the mediating concept, Soper (2000) maintains that “a realist concept of nature is .. a suppressed or repressed ontological presupposition of much that passes for ‘constructivism’.” (p.19) On her view, a distinction must be made between what she calls ‘deep’ and ‘surface’ nature, that is, between “that which is the *condition* of all human modifications and the perceptible domain of ‘nature’ that is the *outcome* of these modifications [emphasis added].” (p.17) Haila (2000) is similarly led to distinguish between ‘first’ and ‘second’ nature:

The former term refers to such elements in the world that have originated without human influence – this, by and large, in the physical background of culture. The latter term refers to such elements in the world that have originated from previous human activities. (pp.167-168)

Notwithstanding the anthropocentricity of her (and Haila’s) position, Soper (1995) maintains that there are three distinct senses of nature: (1) *Metaphysical* - “the concept referring to the difference and specificity of humanity”; (2) *Realist* - “the structures, processes, and causal powers that are constantly operative within the world, serve as objects of study of the natural sciences, and condition the possible forms of human intervention in biology or interaction with the environment”; and (3) *Lay* (or surface) - “the nature of immediate experience and aesthetic appreciation.” (pp.319-320) Adopting a neo-Aristotelian perspective, Lee (1999) goes somewhat further to distinguish seven different senses of nature: (1) *Nature_{nh}* - non-human nature; (2) *Nature_c* - cosmological nature; (3) *Nature_p* - pristine nature; (4) *Nature_{hi}* - human-impacted nature; (5) *Nature_{fa}* - foil to the artificial or nature as ‘other’; (6) *Nature_{nk}* - natural kinds; and (7) *Nature_f* - first matter or nature as ultimate ontological substrate or stuff. (pp.82-83) For the purposes of the present enquiry, however, the three senses of nature identified by Ferré (1988) are sufficient⁶: (pp.28-29)

1. *nature₁* - “the collective term for all that exists apart from the artificial”;
2. *nature₂* - “all that exists in the evolving universe of space and time”;
3. *nature₃* - that which is essential in a thing, that is, that which is expressed “all other things being equal, when it develops according to its kind without outside interference.”

In the next section, the role played by each of these notions in Negrotti’s theory of the artificial will be examined.

3. Negrottian Artificiality

In a recent series of works, Negrotti (1999a, 1999b, 2001a, 2001b) has proposed a theory that aims at clarifying the nature (in the sense of essence, what-ness or *nature₃*) of the artificial. On his view, ‘the artificial’ refers to

any object, process or machine that aims to reproduce some pre-existing natural object or process by means of different materials and procedures. (Negrotti 1999a, p.1)

⁶ It is interesting to note that (3) and (1) correspond to the intuitive (nature as essence or what-ness) and somewhat more obscure (nature as ‘other’) conceptions of nature identified in §1 respectively, while (2) corresponds to Collingwood’s ‘modern’ conception of nature (as the totality of things).

By ‘reproduction’ is understood mimetic production of the ‘essential performance’ (or behaviour) of a natural exemplar based on a more or less shared representation of the latter from a particular observational perspective (or level). More formally, Negrotti (2001a) defines the artificial in terms of the following three conditions⁷: (p.5)

1. A *necessary condition*: the object or the process must be built by man;
2. A *sufficient condition*: the object or the process must be inspired by a natural one;
3. A *methodological constraint*: the object or the process must be realised by means of materials and procedures different from those nature adopts.

Although Negrotti emphasises the grounding of his theory in the triad of observation, exemplar and essential performance, it is the latter two notions and the role played by what is referred to as ‘conventional technology’ in the theory that are relevant to the critique of Negrottian artificiality presented herein. In terms of Ferré’s three senses of nature (§2), the notion of an exemplar – more specifically, a *natural* exemplar – necessitates consideration of *nature*₁ (that is, nature as ‘other’) while that of an essential performance necessitates consideration of *nature*₃ (that is, nature as what-ness or essence). In what follows, it is argued that the way in which these notions are conceptualised is critical to the success of the theory of the artificial. This is because how *nature*₁ and *nature*₃ are conceived (at least partially) determines the extent to which technological products (or artifacts) and the processes (of artificing) that engender them can be shown to be ontologically similar to (or distinct from) the corresponding naturals they seek to reproduce. In short, *nature*₂ (that is, nature as an existential totality that encompasses the artifactual and hence, the artificial) is at issue.

Prior to discussing the philosophical problems associated with Negrottian artificiality, it is important to appreciate the merits of this theory. These are, arguably, (1) the self-evident simplicity of its conceptual foundations, (2) its internal consistency (or theoretical coherence), and (3) its possible overall correctness. Nonetheless, it is maintained that Negrotti’s theory of the artificial fails the test of adequacy (or closure) because it is *incomplete*. In what follows, it will be shown that this incompleteness arises as a direct consequence of the explicit affirmation of a number of problematic metaphysical assumptions about the *nature*₃ (as essence or what-ness) of *nature*₁ (as ‘other’ to the artificial). From the perspective of this critique, two of these are particularly significant: *essentialism* (that is, the view that there is an essence or what-ness associated with every phenomenon) and *realism* (that is, the view that a human-independent reality exists)⁸.

4. The Philosophy of The Artificial

It is important to appreciate at the outset that Negrottian essentialism is wholly epistemic in character, being motivated by an operationalist (that is, performative or

⁷ Strictly speaking, these conditions are not separable into necessary, sufficient and methodological in the way that Negrotti has attempted to show; rather, when taken together as a set, they constitute necessary and sufficient conditions for artificiality.

⁸ Other assumptions such as representationalism (that is, the view that cognition necessarily involves representations) are not examined in this paper. However, the issue of observation which is, arguably, related to the question of representationalism, will be addressed, albeit indirectly, in the context of a discussion of the phenomenon of consciousness and its possible bearing on essentialism and realism.

behavioural) perspective on the possibility of artificial reproduction of the natural. As Negrotti (2001a) states, “what we name the *essential performance* of a natural *exemplar* always is ‘essential’ with reference to some specific *observational level*, and not in ontological terms.” (p.8) On his view, “the problem of the essential truth [in an ontological sense] is beyond the possibilities of human effort [since] the only strategies available to man are those of knowing or reproducing the world through operational expedients that pragmatically capture what is compatible with the assumed model and the multiple selections it implies.” (Negrotti 1999a, p.67) Crucially, as he goes on to state, “questions such as ‘what is reality in and of itself’ have no meaning in the context of [the theory of the artificial]. The reality we refer to is the reality we can potentially or actually perceive, and not its ontology.” (p.3) However, such epistemic essentialism should not be taken to entail a commitment to ontological relativism of the subjectivist kind since “there is something in the world that exists independently of our mind, with a life of its own.” (p.2) In short, Negrotti appears to be committed to epistemological essentialism and ontological realism. However, it is crucial to appreciate that on his version of realism, there are two ‘orders’ of natural reality, the accessible (sensible or perceptible) and the inaccessible. As he states, “the objects that we perceive from the observation levels that we assume in each unit of time and space are not ‘pieces’ or partial spheres of reality: rather, they are the verifiable reality that we can grasp from those selected levels.” (Negrotti 1999a, p.13)

In addition, it is important to note that on Negrotti’s view, natural phenomena are hierarchically structured; however, it is somewhat unclear whether such hierarchies are ontological or merely epistemic. Furthermore, the impossibility of knowing the relations between all levels in such hierarchies suggests that, for Negrotti, naturals are infinitely – as opposed to indefinitely – disclosable. Explicit evidence in support of such a view is provided by statements such as the following: “the observational levels of concrete reality - both of the natural and of the artificial reality - and their interplays have to be considered as infinite” (pp.36-37); again, there are “endless levels of potential observation” (p.70). However, it is again somewhat unclear whether infinite disclosability refers to accessible or inaccessible reality; while it is clear that Negrotti holds inaccessible reality to be infinite⁹, the ‘as’ appearing in the first of the latter statements would seem to imply that accessible reality is structured as a finite hierarchy.

5. Problems with The Theory of The Artificial

One of the principle advantages of the above hybrid epistemological-essentialist and ontological-realist position – which Negrotti refers to as ‘objective relativism’ - over alternatives is that it does not give rise to the epistemic fallacy¹⁰ in connection with the natural¹¹. This is significant because erasure (or collapse) of the nature-artifact distinction

⁹ Negrotti (1999a) maintains that “reality includes, that is to say, it has in itself, all the features observable by all the species, along with infinite others which cannot be observed by any species and which are sometimes revealed through investigations using scientific instruments.” (p.14)

¹⁰ This is the error of conflating representations of reality with reality itself.

¹¹ The situation in relation to the artificial is somewhat different since “no particular difference exists between the situation in which the artificialist looks at reality as it is and the one in which the artificialist constructs reality, i.e. sees what he wants to see.” (Negrotti 1999a, p.69)

under both naïve essentialism (everything is natural) and its antithesis, radical constructivism (everything is artificial in the sense of artifactual) can be shown to be grounded in the epistemic fallacy (Soper 2000). Thus, Negrotti's theory *appears* to provide a sound basis upon which to mount a defence of the legitimacy of this distinction¹². Yet granted the clarity, coherence and (overall) correctness of Negrotti's theory of the artificial, it remains unclear whether it is, in fact, *complete* by which is meant that it provides an adequate characterisation of all the elements in the theory, for example, the *nature*₃ (as essence or what-ness) of *nature*₁ (as 'other' to the artificial). The need to resolve this issue becomes pressing once it is appreciated that the epistemic fallacy arises only if it is assumed, following Kant, that appearance does not – *cannot* - disclose the whole of reality and that knowing is, ultimately, separated from being. It is precisely these 'transcendental' realist assumptions that are contested by Heidegger.

As Schatzki (1982) has shown, Heidegger is an empirical realist: On his view, what something is 'in itself' is what it is independently of its *actually* being encountered by a *Dasein* (that is, a being capable of appreciating the being of a being); as stated previously, Kant, by contrast, is a transcendental realist: On his view, what something is 'in itself' is what it is independently of any *possible* knowledge of it. Negrottian essentialism ostensibly mediates these two kinds of realism in affirming the existence of an accessible reality – that is, one that is potentially or actually capable of being perceived – on the one hand, while simultaneously acknowledging the existence of an inaccessible reality on the other. Such a move appears consistent with Heidegger's (1971) assertion that being is self-concealing and, thereby, always remains (at least) partly undisclosed. However, it is important to appreciate that that which is undisclosed (or unaccessed) is not necessarily identical to that which is undisclosable (or inaccessible). On this basis, it might be argued that the incompleteness of Negrotti's theory has its source in the erroneous assumption that ontological relativism entails ontological agnosticism and the implications of this fact for his conception of the natural. Clearly, his identification of reality as it is 'in-itself' with an inaccessible reality implies a tacit commitment to a Kantian conception of the real. On his view, "it does not matter what the world is in itself, since the only ways we have at our disposal to describe the world are our representations of it." (Negrotti 1999a, p.15) However, such a representationalist or constructivist position is readily shown to be problematic when the question concerning the ontological status (appearance or reality) of the phenomenon of consciousness is considered. As Searle (1992) has rightly argued, "where appearance is concerned we cannot make the appearance-reality distinction because the appearance is the reality" (p.122). In short, at least in the case of consciousness, reality is accessible and as it is in-itself.

The foregoing might seem to suggest that Heidegger is a surer guide than Kant, at least with respect to the question concerning the ontology of the natural. While this view is partially correct given the consistency of Heidegger's empirical realism with the phenomenological facticity of direct, unmediated access to the reality of consciousness, it does not take into consideration the fact that Heidegger's own conception of the natural is itself highly problematic. On his view, nature as it is in-itself is 'absurd', intrinsically meaningless and essentially non-experiential (Heidegger 1927). This point is of critical

¹² Unfortunately, it remains unclear whether this remains the case if the distinction is given a 'strong' (or ontological) as opposed to a 'weak' (or merely epistemological) interpretation.

significance since in endorsing empirical realism while simultaneously conceiving nature as intrinsically non-experiential, Heidegger is confronted with the ‘hard problem’ of consciousness (Chalmers 1996), that is, the problem of explaining how ontological subjectivity (or first-person experience) can arise from an ontologically-objective (or non-experiential) substrate. Heidegger cannot solve this problem because of his commitment to an ontological dualism of experiential subjects and non-experiential objects, a categorial distinction that is clearly at odds with the assumption of ontological continuity (or monism) that is, arguably, a cornerstone of that scientific naturalism with which empirical realism is aligned¹³.

It is worthwhile briefly summarising what has been established thus far in the discussion. First, some form of empirical realism must be correct since consciousness is an accessible reality and it constitutes at least one instance of reality as it is in-itself. Second, Heidegger’s particular brand of empirical realism is problematic in that it cannot solve the ‘hard problem’ on account of its assumption of a non-experiential (or ‘vacuous’) *nature*₃ (as essence or what-ness) of *nature*₁ (as ‘other’ to the artificial). From these facts it follows that in order to circumvent the ‘hard problem’ of consciousness while simultaneously endorsing empirical realism, it is necessary to reconsider the ontology of *nature*₁.

6. Whiteheadian Naturality

Griffin (1998) defines Whiteheadian panexperientialism as a process-atomism in which the fundamental units of *nature*₁ are held to be dipolar physical-mental events of finite duration (actual occasions of experience), relationally-constituted via a process of actualisation (concrecence) involving creative selection of physical feelings (prehensions) of actualised events (objects) by actualising events (subjects). Crucially, Griffin (2000) maintains that

[the] embodiment of creativity in each actual occasion involves two modes. In the first mode, it is embodied in the occasion’s moment of *subjectivity*, during which the occasion enjoys its own experience. This mode has two poles: the ‘physical pole’, during which the occasion receives the [efficient] causal influence from the past, and the ‘mental pole’, during which it exercises its own final causation or self-determination. Following this subjective mode of existence, the occasion exists in its *objective* [or ‘superjective’] mode, which means that it is an object for subsequent subjects. In this mode, its capacity to exercise self-determination is over, but it can now exercise efficient causation upon others. (p.176)

Prehensions (or feelings) are differentiable into two kinds: *physical* and *conceptual*; in the former, the objects of prehension are *concrete actualities* (that is, prior actual occasions) while in the latter, the objects of prehension are *abstract potentialities* (that is, Platonic forms or what Whitehead refers to as ‘eternal objects’). Physical prehensions can be further differentiated into *pure* and *hybrid* kinds, the former providing the explanation

¹³ This point is somewhat contentious. According to Dreyfus (1991), empirical realism is consistent with scientific naturalism; hence, Heidegger would presumably support some kind of scientifically-realist account of the evolution of consciousness from a non-conscious (or ‘vacuous’) substrate. However, Pylkkö (1998) and Christensen (1998) have separately argued that this ‘naturalism-friendly’ interpretation of Heidegger is incorrect. Clearly, the critique of Heidegger presented here assumes the validity of the Dreyfusian reading.

for the almost complete uniformity of nature at the subatomic level and the latter, for the possibility of phenomenal evolution. According to Griffin (1998),

in a *pure physical feeling*, the previous actual occasion is felt *in terms of its own physical pole*, which means that what is passed on to the present occasion is what the past occasion had in turn received from previous occasions. Accordingly, even if some novelty cropped up in the mental pole of that previous occasion, it is bypassed by a pure physical prehension. What we usually think of as the ‘physical world’ in the strictest sense – roughly, the world of subatomic entities, atoms, and ordinary molecules – is characterised (by hypothesis) almost entirely by pure physical feelings. The virtually indestructible proton is the paradigmatic instance, as it retains its character over many billions of years .. The so-called laws of nature are merely habits to be sure, but the enduring individuals at that level are *so* habit-bound (at least when in inorganic surroundings) that the laws can appear to be imposed. All the causal relations at this level can appear to be ‘purely physical’ because they are: All the efficient causation between events involves physical prehension.

In a *hybrid physical feeling*, by contrast, the previous occasion of experience is prehended in terms of its mental pole, with its conceptual feelings. This is still a type of *physical feeling*, because the objects felt is an actuality, not a mere possibility. But it is a *hybrid physical feeling* because that prior actuality is felt in terms of *its* prehension of *possibilities*. Among these possibilities may be some *novel* forms, meaning ones not simply received from the past world. If this occurs, then a future occasion of experience, by means of a hybrid physical feeling, can incorporate that novel form into its own physical pole. From then on this once-novel form can be passed on to subsequent occasions in the enduring individual by means of pure physical feelings. (pp.194-195)

It is important to appreciate that, unlike crude panpsychism, panexperientialism does not assert (1) that *all* beings are experiential nor (2) that those beings that *are* experiential are experiential in the *same way*¹⁴. On this metaphysics, only the fundamental primitives of nature (that is, actual occasions of experience) and certain complexes (‘societies’ or ‘nexūs’) constituted from combinations of these primitives are held to be experiential. Whitehead distinguishes “enduring individuals as societies that are purely temporal, meaning that there is only one actual occasion at a time [from] *spatiotemporal* societies, in which many enduring individuals are combined.” (p.185) Whitehead, following Leibniz, further differentiates spatiotemporal societies into those that are *aggregational* and those that are *compound individual* on the basis of internal (or constitutive) relational organisation. In the former, the society as a whole “does not have any experiential unity that allows it to feel and act as an individual”; in the latter, by contrast, “there *are* experiences of a higher and more inclusive type that give the society as a whole an overall experiential unity. These higher-level experiences can be called *presiding*, *regnant*, or *dominant*, because they exercise greater power over the society as a whole than do any of the other members, thereby giving the society as a whole a unity of response and action in relation to its environment.” (Griffin 1998, p.186)¹⁵

According to Griffin (1998), “exactly which enduring things should be considered compound individuals, rather than mere aggregational societies, is an empirical question, to be settled in terms of whether this behaviour seems to require a central agent with an element of spontaneity or self-determination.” (p.186) While conceding that the matter of

¹⁴ In Heideggerian terms, a commitment to ontological (or metaphysical) monism does not entail a commitment to ontical (or phenomenal) monism.

¹⁵ It is crucial to appreciate that the Whiteheadian view is not that the many *are* one but rather that the many *become* one, and are *increased* by one; thus, the emergence of higher-level compound occasions of experience must be ontological (and not merely epistemological).

classification is an empirical issue, it is contestable whether this issue *must* – or even *can* - be settled by an appeal to behavioural criteria since experience is not necessarily correlated with behaviour. Consider, for example, people suffering from the condition known as Guillain-Barré syndrome who are completely paralysed yet also fully conscious (Searle 1992). Then there is Searle's famous Chinese Room thought experiment (Searle 1980) which purports to show how apparently intelligent behaviour can be produced in the absence of genuine understanding and awareness (that is, conscious experience). Finally, there is the logical possibility of zombies, that is, beings capable of replicating the behaviour of conscious beings without being conscious themselves (Chalmers 1996). Although the possibility of zombies is excluded under panexperientialism (since consciousness is causal on this view while necessarily being epiphenomenal on the alternative position), this does not undermine the central thesis of the preceding argument. This is because, as Griffin implicitly concedes, behavioural criteria can only provide *apparent*, that is, epistemic evidence and hence, are inconclusive.

Can aggregates and compound individuals be differentiated ontologically and, if so, how might this be done? A pointer in the direction of a possible solution is provided by Birch (1990) who maintains that

the concept of an individual, from protons to people, involves the notion that each is what it is by virtue of its relationships with its environment. There are, of course, objects that are aggregates of natural entities such as a wheel that is still the same wheel whether it is turning or stationary. That is because the unity of the wheel is a mechanical one *built into it by the engineer* [emphasis added]. (p.75)

It is maintained that in order to distinguish compound individuals from aggregates, it is necessary to augment conventional Whiteheadian panexperientialism with a phenomenological account of artificing that describes the ontologically distinct manner in which artifacts come to be¹⁶. According to Heidegger (1959, 1969), being and becoming are the 'same' in the sense that they belong together in essential, unitary relation. This onto-phenomenological perspective is consistent with that of panexperientialism in which it is maintained that the being (or existence) of an actual entity *is* its becoming or process. The upshot of this is that a difference in becoming (or process) entails a difference in being (or product); alternatively, a *poiētic difference* (that is a difference in way of coming-to-be) entails an *ontological difference* (Ali 1999).

7. The Phenomenology of Artificing: I

According to Lee (1999), "the artifactual and the natural belong to two very different ontological categories - one has come into existence and continues to exist only because of human purpose and design while the other has come into existence and continues to exist independently of human purpose and design." On her *teleological* view of the distinction between nature and artifacts, "the artifactual embodies extrinsic [or] imposed teleology [which has its origin in human intentionality] while the natural (at least in the form of individual living organisms) embodies intrinsic [or] immanent teleology." (p.2)

¹⁶ Although not all aggregates are artifacts (for example, stones and clouds), all artifacts are, it will be argued, aggregates. Formally speaking, the set of artifacts is a subset of the set of aggregates.

Crucially, Lee maintains that “an analysis in terms of Aristotle’s causes shows that all four causes, since later modernity, may be assigned to human agency.” (p.2)¹⁷ On her view,

the initial elimination of the final and the formal causes from the study of natural entities and phenomena prepares the way ultimately for the introduction of human designs and purposes in the project of transforming the natural into the artifactual *via* science and technology. In other words, human agency, substituting for natural processes, becomes the predominant efficient cause. As the last half of the twentieth century shows, even the material cause is reduced to the ontological minimum, as nature is being manipulated increasingly at the level of atoms and molecules, not at the level of natural kinds, by human agency. (p.5)

For example, in the context of a discussion of transgenic organisms, she maintains that

not only are the formal, final, and efficient causes of transgenic organisms identified in human terms, even their material cause is the handiwork of humans. Humans have put together bits of genetic material in order to create them according to their own design. *Ex hypothesi*, such genetic materials would not have come together without deliberate human intervention. (p.53)

However, to infer from statements such as the above that no in-principle limit to the reduction of intrinsic material causation in nature exists can be shown to be problematic for (at least) three reasons: First, only if the analysis of material causality is restricted to a *specific* phenomenal level – irrespective of which level and what the phenomena at this level are like – does the argument against establishing *a priori* ontological limits to artificing carry any weight since at lower – or ‘deeper’ – levels, the material cause remains natural or ‘given’ and hence, intrinsic; second, as Heidegger (1977) has shown, the nature (as essence) of artificing (that is, technology or artifact construction) is grounded in a subject-object orientation¹⁸ in which the substrate (or ‘matter’) of artificing is held out as objectively standing over against the subject. This is not a mere epistemic ‘regarding’; on the contrary, it is a hermeneutically-constitutive (and hence, ontological) way of relating to ‘the given’ through time and such way that the intrinsic being of nature is prevented from manifesting itself; third, on Whiteheadian panexperientialism, ‘first matter’, that is, the ultimate ontological substrate that is *nature*₁, has an internal or subjective aspect that is technologically inaccessible yet ontologically-constitutive, thereby placing an ontological limit on the scope for manipulation of material causality by an increasingly ‘deep’ science and its concomitant technologies.

In fact, Lee’s own position appears to be at least consistent with the view that ontological limits *can* be set to the technological project. For example, and again in the context of discussing transgenic organisms, she maintains that

¹⁷ Lee (1999), following Aristotle, “locates a crucial distinction between the natural and the artifactual in terms of the *efficient* cause.” More specifically, “in an artifactual entity, the efficient cause (as much as the formal and final causes) comes from without.” (p.50)

¹⁸ That Lee (1999) would appear to concede this point is evidenced by her assertion that “in spite of quantum mechanics and its associated characterisation of reality, a considerable amount, if not the bulk of science [and technology] practiced today, is conducted within the Newtonian-*cum*-Euclidean framework.” (p.9)

transgenic organisms may be said to possess a much higher degree of artifacticity compared with organisms produced through the traditional means of breeding – their efficient, final and formal causes are humanly inspired, imposed and executed, while *their material cause is technologically derived from other existing natural kinds* [emphasis added]. (p.54)

It might be further argued that her position is minimally consistent with Whiteheadian panexperientialism based on statements such as the following: “the account given so far may still be both partial and interim, serving to pave the way for a fuller exploration of the notion of independent value and its intimately related concept of the trajectory” (p.177); and even more directly, “a world without human consciousness is a world without recognised-articulated values, but it is not a world without mutely-enacted values.” (p.165)¹⁹ Yet to interpret her position in this panexperientialism-friendly manner is, ultimately, problematic given the following statement:

To look for sameness between the human and the non-human in order to ground respect for the latter, perversely, may lead to the very trap of reductionism laid by the metaphysics of Scientific Naturalism itself. This postulates .. that ultimately all the differences, observed or otherwise, between natural kinds or between individual specimens belonging to the same or different natural kinds are *au fond* merely different arrangements of atoms and their molecules .. [The] program of molecular nanotechnology is predicated precisely upon that metaphysical foundation. The stuff of the universe is homogeneous and uniform. (p.183)

There are (at least) three points to note in connection with the above: First, Lee implicitly assumes that a commitment to scientific naturalism entails a commitment to atomistic reductionism (or monism) of the conventional materialist kind. However, Griffin (1998, 2000) maintains that Whiteheadian panexperientialism *is* a form of naturalistic, atomistic monism, yet one which supports phenomenal pluralism and on the basis of *active* rather than *passive* (‘merely different arrangements’) organisational distinction²⁰; second, and relatedly, Lee fails to distinguish between ontological (or metaphysical) monism and ontical (or phenomenal) monism; and third, Lee’s rejection of metaphysical monism *per se* (on Aristotelian substantialist grounds) means that she is faced with the ‘hard problem’ of consciousness (Chalmers 1996), that is, the problem of explaining how ontological subjectivity can emerge from an ontologically-objective substrate. According to Lee,

the ontological characteristics of independence and autonomy are primary while the axiological characteristics of being complex, intricate, *sentient* [that is, experiential] or whatever are secondary. *Artifactual entities may amply exhibit the secondary axiological characteristics; ex hypothesi, they do not and cannot display the primary ontological characteristics which only naturally occurring entities and processes possess* [emphasis added]. (p.180)

¹⁹ Lee (1999) distinguishes between intrinsic value or being ‘for itself’ (that is, striving to maintain functionality) and independent value or being ‘by itself’ (that is, coming-into-being and persisting as such); on her view, biotic (or living) entities manifest both kinds of value whereas abiotic (or non-living) entities manifest only the latter.

²⁰ It appears that Lee (1999) is led to reject monism because of a commitment to teleological pluralism and the intrinsic lawfulness of abiotic nature (or nature ‘by itself’). However, on Whiteheadian panexperientialism, there are no eternal *laws*, only enduring *habits* thereby allowing for a teleological pluralism grounded in a creative, ontological (that is, metaphysical) monism.

It is maintained that Lee's claim that sentience is merely a secondary, axiological characteristic like complexity and intricacy is problematic for (at least) three reasons: First, it contradicts the phenomenological evidence that establishes experience as reality as it is in-itself; second, placing complexity, intricacy and sentience (or experience) in the same category constitutes an instance of category error since sentience is the *condition* for complexity or intricacy; and third, it engenders the 'hard problem'. In addition, Lee's position is problematic since in asserting that "artifactual entities may amply exhibit the secondary axiological characteristics", she fails to consider the possibility that a characteristic may not manifest objectively, that is, in such a manner that it can be exhibited. Clearly, consciousness is an example of such a phenomenon and, on Whiteheadian panexperientialism, so is creativity.

8. The Phenomenology of Artificing: II

Ladrière (1998), in a synthesis of Aristotelian, Heideggerian, and Whiteheadian metaphysics, describes the essence of artificing in terms of "a transition from a state of [subjects] able to operate by themselves in the context of the interactions in which they participate, to a state in which natural elements become simply the passive [objects] of a function which is susceptible, in principle, of being realized as well on the basis of other [objects]." (p.75)²¹ Crucially, as he goes on to state,

Poiesis [or *techne* in the sense of artifactual production] is a provenance which introduces into the linking of cosmic emergences a breaking off: it diverts some natural objects from their prior destinations and thereby breaks off the continuity of *genesis* [or *physis* in the sense of natural production]; it gives them a new destination which is no longer of a cosmic nature. But it can do this only by taking advantage of the availability of those objects, by transforming their capacity for entering into the genesis of more complex natural objects into a capacity of being used as the substrate for an unprecedented configuration which comes from elsewhere. (p.76)

According to Ladrière, the essence of technique lies in the performance of "a sequence of operations organized according to an abstract schema of a general but applicable character" (p.81), a position that is consistent with both Negrotian artificiality and Whiteheadian panexperientialism. However, what is missing on all accounts – including Whitehead's – given a panexperientialist metaphysic, is a description of the relation between the process of abstraction associated with artificing and the formation of non-experiential aggregational societies. To the extent that abstraction involves the severing of contextual relations constitutive of the concrete phenomenon from which the abstraction emerges, it is readily construed as a process generating beings capable only of external (that is, accidental) relation. This is because contextual relations are spatio-temporal, thereby allowing for the passage of occasions from subjectivity into objectivity (superjectivity), whereas abstraction – involving the elimination of the temporal – effectively 'freezes' (or hypostatizes) occasions, locking their being into an objective, purely spatial modality. On this basis, it might be argued that abstraction effects a

²¹ In the original citation, the terms in brackets are replaced by their opposites (that is, 'subject' by 'object' and vice-versa). The inversion is, however, necessary given the adoption of a panexperientialist metaphysics. (To be precise, on panexperientialism, the distinction is not so much between active subjects and passive objects as between self-acting subjects and other-acting objects.)

transformation ('collapse') of processual being into substantial being. In this connection, it is significant to note with Wiehl (1990) that "the abstract character of the causality of things and substances towards themselves as well as among each other are *purely external relations*, which only exist in the forms of [spatial] extension [emphasis added]." (p.143) Crucially, according to Spaemann (1990), "the reduction of actuality to the aspect of mechanical exteriority [that is, purely spatial extension] is nothing more than its anthropocentric reduction to whatever enables us to employ it for our purposes." (p.159)²² With regard to the 'blocking' of the capacity for creative (that is, self or final) causation, Griffin (1998) maintains that, in complexes formed from actual occasions causally related to each other via *purely physical* prehensions, "there is virtually no origination of novelty." (p.195)

According to Ferre (1996a), "experience is fundamentally a field of internal relations in which some elements may have stronger or weaker levels of internal relatedness." (p.354) Crucially, he goes on to maintain that "diminution of quality in subjective immediacy" can occur "either by *forcing* discordant elements on subjectivity or by *negating* elements of potential richness [emphasis added]." (p.360) Ferre (1996b) indicates the intrinsic temporality of such en-forcing – or, in Heideggerian (1977) terms, En-framing (*Ge-Stellen*) – in referring to "effective purpose *sustained over time* by constant renewal and refreshment [emphasis added]." (p.97) According to Sherburne (1966), "originality is both 'canalized' – to use Bergson's word – and intensified" through hybrid prehension, that is, "the prehension by one subject of a conceptual prehension, or of an 'impure' prehension, belonging to the mentality of another subject." (p.94) In the context of artificing (that is, the coming-to-be of artifacts), this 'other' subject is the human artificer. As Whitehead (1929) states, "when mentality is working at a high level, it brings novelty into the appetitions of mental experience. In this function there is a sheer element of anarchy. But mentality now becomes self-regulative. It *canalises* its own operations by its own judgements [emphasis added]." (p.34) This panexperientialist conception of artificing appears to be consistent with Negrotti's (2001a) own view of this process, viz. "artificialists try to force the environment or the hosting organism to orient themselves only towards the same *observation level* taken in the design and in the building up of the artificial device." (p.13)

In summary, and according to Ladrière, "art adds to [the properties of natural beings] a totally emergent capacity." (p.87) However, it is important to appreciate that such *expansion* in the artifactual sphere is necessarily offset by a corresponding and concomitant *contraction* in the natural sphere; in short, artifactual emergence, while grounded in the natural, is non-cumulative with respect to the latter. As he goes on to state,

the technical universe, by generating novel forms, allows us to see the determinability and visibility of Being. But it thereby overshadows that other aspect of Being which is revealed in *genesis*, and, in a certain way also, in *poiesis* – namely, Being as availability, as reserve, as withdrawal, as that abyssal foundation from which comes the proliferation of forms, the profusion of the possible. (p.89)

In short, artificing constitutes a 'rupture' of (and 'irruption' into) the natural.

²² Lee (1999) identifies "the philosophical basis for the transformation of the natural into the artifactual [as] Humean projectivism and the metaphysics of Scientific Naturalism." (p.4)

9. Implications for “Strong” Artificiality

If Whiteheadian panexperientialism is the way that nature is in-itself then the possibility of artifactually constructing replicants of natural phenomena – that is, “strong” artificiality - is radically undermined. This is because, as has been previously shown, artificing (construction, making) involves an orientation in which subjects stand in ontological opposition to objects, ‘rupturing’ the nexus of internal (constitutive) relations constituting natural beings so as to establish - more precisely, *impose* - external (non-constitutive) relations between ‘primitives’ (components) in the synthetic (or artifactual) systemic complex. The implications of this conception of *nature*₁ for artificiality are similar to those identified by Negrotti – but for very different reasons.

For example, on Negrotti’s (1999a) theory of the artificial, “we can define A as a replication (in empirical terms and not logical) of B if A is the result of a reproduction of the exemplar B at all its observation levels by using the same materials and, more importantly, by drawing upon all its performances, without making any selection of essential performances.” (p.75) However, on this view, construction of a replicant (that is, an artifactual replication of a natural exemplar) is held to be impossible because such a synthesis “would require the analytical knowledge of the intimate relationships among [the elements taken to constitute the essential performances] at all possible observation levels. Since analysis implies selection of observation and representation levels – and analysis is, of course, the first step of scientific work – in scientific terms it is impossible to grasp reality as a whole.” (p.184) Although Negrotti appears somewhat reluctant to embrace such a position, as is evidenced by his reference to “the complex methodological difficulties, *perhaps conclusive*, which every attempt to cumulate multiple performances in an integrated artificial device is fated to meet [emphasis added]” (p.38), he maintains that replication is possible but in only three instances: (p.78)

1. “When we know all the steps and all the components needed to reproduce something, for example, in the case of mass production;
2. When we are able to act as combiners of natural elements which, when they are combined, are necessary and sufficient for producing a complete system, as, for example, in the case of artificial insemination;
3. When the reality to be reproduced is composed or is describable from only one possible level of observation: this is clearly possible only for a reality man has himself created in purely formal or informational terms, as, for example, in the case of replicating a computer program.”²³

According to Negrotti (1999a), the difference between the synthetic and the artificial is that the latter necessarily “adopts materials and procedures which are different from those that constitute the exemplar, whereas the former, by definition, does nothing more than suitably combine natural constituents. The replication by synthesis is *merely* the generation of natural structures generated by the man who controls the required natural constituents [emphasis added].” (p.76) The problem with this view is that it assumes,

²³ According to Negrotti (1999a), the replicability of technological systems follows from their closure, formality and capacity for finite description at a single level of observation. The non-replicability of natural systems, by contrast, follows from their openness, (partial) non-formality and capacity for infinite description at infinite levels. Clearly, a metaphysical assumption of hierarchical infinitism is being made.

erroneously, that the becoming of artifacts (or *poiēsis* in the mode of *technē*) is ontologically continuous with the becoming of naturals (or *poiēsis* in the mode of *physis*).

For example, in (2) above, reference is made to the necessity and sufficiency of combined natural elements vis-à-vis the production of (natural) systems. However, on Whiteheadian panexperientialism, the process of concrescence (that is, production or actualisation) of a systemic phenomenon – a high-grade actual occasion or ‘society’ - is marked by phases which can, crudely, be separated (if only for purposes of exposition) into the preparatory and the consummatory. The former involves partial constitution – efficient causation - of the systemic complex by prior actual occasions in their objective mode of existence while the latter involves partial self-constitution – final causation – of the complex via distinction (selection or ‘decision’) of incoming efficient causation into positively and negatively prehended (or ‘felt’) occasions (Griffin 1998). Granted that the combination of natural elements is necessary and sufficient for systemic production, it remains to distinguish preparatory necessity from consummatory necessity while locating sufficiency in the conjunction of the two. On this basis, it might be argued that it is possible for the human artificer to establish preparatory necessary conditions since these involve a subject (the artificer) putting objects (prior actual occasions) into a specific constituting relation; however, consummatory necessary conditions cannot be established in this way since consummation (or, in Whiteheadian terms, ‘satisfaction’) of an actual occasion involves an irreducible element of self-causation. Processes such as artificial insemination must, therefore, be understood as hybrid or impure from the perspective of their artificiality in that it is on account of their naturalness that replication is possible²⁴.

However, it is crucial to appreciate that the role played by self-causation in the individual is not limited to its initial coming-into-being (or genesis). That this is the case follows from the fact that, on panexperientialism, beings are essentially processual; in short, *beings are becomings*. For example, and in the related context of human cloning, Ferré (1997) maintains that

clones will be full human beings. But if personalistic organicism is correct, these full human beings will, as they develop toward maturity, be *partially self-creating* of themselves as the persons they become. *This* is the “miracle” in personhood, that each person is to a significant degree opaque to predictive science because each person is partially self-determining, within the twin constraints of the capacities provided by genetic endowment and the opportunities and challenges provided by environment. The miracle of personhood is that neither nature nor nurture - nor any combination of the two - is fully determining. (p.67)

On this basis, he concludes that “personalistic organicism puts a full stop to the notion that *persons* can be replicated. Human organisms can and almost certainly will be cloned. But human persons, never.” (pp.67-68) Negrotti, himself, appears to support such a position in maintaining that ‘transfiguration’, that is, progressive bifurcation of the essential behaviour (or ‘performance’) of the artificial relative to that of its natural

²⁴ According to Lee (1999), “there are degrees of ‘artificiality’ depending on the degrees of control and precision with which science and technology manipulate nature.” (p.3) Given the ‘reflexive dynamics’ between natural and artificial systems (Negrotti 2001b), it follows that, ontically-speaking, there must also be degrees of naturalness. Lee further maintains that “the degree of artificiality of an artifact depends on .. the matter or stuff (the material cause) of which the object is made [and is] at its highest when humans succeed in designing the artifacts from scratch.” (pp.52-53) Once again, “the deeper the science and its accompanying technology, the greater the degree of artificiality in the artifacts produced.” (p.85)

exemplar, arises from differences in their respective materials and processes – the ‘inheritance principle’ – originating in the selective (or abstracting) act that is constitutive of the process of artifact construction²⁵.

Finally, in the context of a discussion of transgenic organisms, “whose historical origin and status were those of an human artifact”, Lee (1999) maintains that “in the wild, the natural processes of selection and evolution would, over time, subdue, if not totally eliminate, such a history in its progeny, reverting it to the status of being naturally-occurring entities.” (p.97) The reference to ‘wildness’ is crucial here since in a wholly artifactual universe, there would nor could be no natural, that is, non-human, processes that could effect what might be referred to as the self-*re*-organisation of the natural (Ali 1998, 1999)²⁶.

References

- Ali, S.M. (1999) *The Concept of Poiesis and Its Application in a Heideggerian Critique of Computationally Emergent Artificiality*. Ph.D Thesis. Brunel University.
- Ali, S.M., Zimmer, R.M., Elstob, C.M. (1998) The Question Concerning Emergence: Implications for Artificiality. In *Computing Anticipatory Systems: CASYS – First Conference*. Edited by D.M.Dubois. AIP Conference Proceedings 437. Woodbury, NY, 138-156.
- Birch, C. (1990) *On Purpose*. Kensington, New South Wales University Press.
- Chalmers, D.J. (1996) *The Conscious Mind: In Search of a Fundamental Theory*. Oxford, Oxford University Press.
- Christensen, C.B. (1998) Getting Heidegger Off the West Coast. *Inquiry* 41, 65-87.
- Collingwood, R.G. (1945) *The Idea of Nature*. Oxford, Oxford University Press.
- Dreyfus, H.L. (1991) *Being-in-the-World: A Commentary on Division I of Heidegger’s Being and Time*. Cambridge, MIT Press.
- Ferré, F. (1988) *Philosophy of Technology*. Englewood Cliffs, Prentice-Hall.
- Ferré, F. (1996a) *Being and Value: Toward a Constructive Postmodern Metaphysics*. Albany, State University of New York Press.

²⁵ According to Negrotti (1999a), transfiguration follows from the fact that, “while natural processes allow for the generation of systems that automatically include all the possible levels of reality and of observability, the artificialist must choose, decide, gamble upon something as being essential.” (p.75)

²⁶ For Lee (1999), it is the ‘residual telos’ of biotic artifacts that makes possible their re-naturalisation. However, her decision to restrict residual *telē* to systemic complexes, more specifically living systems, is problematic since the categorial chasm that is the ‘hard problem’ thereby remains unaddressed. The Whiteheadian solution to this problem involves projecting intrinsic/residual *telē* back to the components of such biotic systems.

Ferré, F. (1996b) Technology and The Future: On Dreaming the Impossible. *Zygon* 31 (1), 93-99.

Ferré, F. (1997) On Replicating Persons: Ethics and The Technology of Cloning. *Philosophy and Technology* 3 (2), 54-69.

Griffin, D.R. (1998) *Unsnarling The World Knot: Consciousness, Freedom, and The Mind-Body Problem*. Berkeley, University of California Press.

Griffin, D.R. (2000) *Religion and Scientific Naturalism: Overcoming the Conflicts*. Albany, SUNY Press.

Haila, Y. (2000) Beyond the Nature-Culture Dualism. *Biology and Philosophy* 15, 155-175.

Heidegger, M. (1927) [1996] *Being and Time: A Translation of Sein und Zeit*. Translated by J. Stambaugh. New York, SUNY Press.

Heidegger, M. (1959) *An Introduction To Metaphysics*. Translated By R. Manheim. New Haven and London, Yale University Press.

Heidegger, M. (1969) *Identity and Difference*. Translated by J. Stambaugh. New York, Harper & Row.

Heidegger, M. (1971) The Origin of The Work of Art. In *Poetry, Language, Thought*. Translated by A. Hofstadter. New York, Harper & Row.

Heidegger, M. (1977) *The Question Concerning Technology and Other Essays*. Translated by W. Lovitt. New York, Harper & Row.

Ladrière, J. (1998) The Technical Universe in an Ontological Perspective. *Philosophy and Technology* 4 (1), 66-91.

Lee, K. (1999) *The Natural and the Artefactual: The Implications of Deep Science and Deep Technology for Environmental Philosophy*. Oxford, Lexington.

Negrotti, M. (1999a) *The Theory of The Artificial*. Exeter, Intellect Books.

Negrotti, M. (1999b) From The Artificial to the Art: A Short Introduction to a Theory and Its Applications. *Leonardo* 32 (3), 183-189.

Negrotti, M. (2001a) Designing The Artificial: An Interdisciplinary Study. *Design Issues* 17 (2), 4-16.

Negrotti, M. (2001b) Who Fears The Artificial? Paper presented at *The Fourth International Conference on The Culture of The Artificial*, Urbino, 25-27 May, 1-5.

Pylkkö, P. (1998) *The Aconceptual Mind: Heideggerian Themes in Holistic Naturalism*. Amsterdam, John Benjamins.

Schatzki, T. (1982) Early Heidegger on Being, The Clearing, and Realism. In *Heidegger: A Critical Reader*. Edited by H.Dreyfus and H.Hall. Oxford, Blackwell, 81-124.

Searle, J.R. (1992) *The Rediscovery of The Mind*. Cambridge, MIT Press.

Sherburne, D.W. (1966) *A Key to Whitehead's Process and Reality*. Chicago, University of Chicago Press.

Soper, K. (1995) Feminism and Ecology: Realism and Rhetoric in the Discourses of Nature. *Science, Technology, & Human Values* 30 (3), 311-331.

Soper, K. (2000) Future Culture: Realism, Humanism, and The Politics of Nature. *Radical Inquiry* 102, 17-26.

Spaemann, R. (1990) Which Experiences Teach Us to Understand the World? Observations on the Paradigm of Whitehead's Cosmology. In *Whitehead's Metaphysics of Creativity*. Edited by F.Rapp and R.Wiehl. Albany, SUNY Press, 152-164.

Whitehead, A.N. (1929) [1958] *The Function of Reason*. Boston, Beacon Press.

Wiehl, R. (1990) Whitehead's Cosmology of Feeling Between Ontology and Anthropology. In *Whitehead's Metaphysics of Creativity*. Edited by F.Rapp and R.Wiehl. Albany, SUNY Press, 127-151.