



Open Research Online

Citation

Ali, S. M. (2002). "The end of The Dreyfus affair": (Post)Heideggerian meditations on man, machine and meaning. *International Journal of Cognition and Technology*, 1(1) pp. 85–96.

URL

<https://oro.open.ac.uk/28459/>

License

None Specified

Policy

This document has been downloaded from Open Research Online, The Open University's repository of research publications. This version is being made available in accordance with Open Research Online policies available from [Open Research Online \(ORO\) Policies](#)

Versions

If this document is identified as the Author Accepted Manuscript it is the version after peer review but before type setting, copy editing or publisher branding

“THE END OF THE DREYFUS AFFAIR”:

(POST)HEIDEGGERIAN MEDITATIONS ON MAN, MACHINE AND MEANING

Syed Mustafa Ali

Computing Department

The Open University

England, UK

s.m.ali@open.ac.uk

Abstract. In this paper, the possibility of developing a Heideggerian solution to the Schizophrenia Problem associated with cognitive technologies is investigated. This problem arises as a result of the computer bracketing emotion from cognition during human-computer interaction and results in human psychic self-amputation. It is argued that in order to solve the Schizophrenia Problem, it is necessary to first solve the ‘hard problem’ of consciousness since emotion is at least partially experiential. Heidegger’s thought, particularly as interpreted by Hubert Dreyfus, appears relevant in this regard since it ostensibly provides the basis for solving the ‘hard problem’ via the construction of artificial systems capable of the emergent generation of conscious experience. However, it will be shown that Heidegger’s commitment to a non-experiential conception of nature renders this whole approach problematic, thereby necessitating consideration of alternative, post-Heideggerian approaches to solving the Schizophrenia Problem.

Keywords. Cognitive Technology, The Schizophrenia Problem, Heideggerian Phenomenology, Hubert Dreyfus, Consciousness, The ‘Hard Problem’, Whiteheadian Panexperientialism.

Biography. Syed Mustafa Ali was awarded a Ph.D from the Department of Electrical and Electronic Engineering at Brunel University, England in 1999. The title of his dissertation was *The Concept of Poiesis and Its Application in a Heideggerian Critique of Computationally Emergent Artificiality*. He has published in a number of areas including philosophy of technology, philosophy of emergence, ontology (Heidegger, Whitehead), philosophy of mind (panpsychism, emergentism), artificial intelligence, and artificial life. Since October 2000, he has been a lecturer in the Computing Department of The Open University and is currently pursuing research in cognitive technology (context in mobile and ubiquitous computing), philosophy of technology (process ontology of artifacts), and complexity engineering (cellular automata incorporating metarules).

1 INTRODUCTION

According to Janney, “an underlying assumption of Cognitive Technology [is] that computers can be regarded as tools for prosthetically extending the capacities of the human mind.” (Janney, 1997, p.1) On this view, Cognitive Technology is not concerned with the replication or replacement of human cognition - arguably the central goal of ‘strong’ artificial intelligence - but with the construction of cyborgs, that is, cybernetic organisms or man-machine hybrids, in which possibilities for human cognition are enhanced (Haraway, 1985). However, it may be necessary to reconsider this position in order to address what might be referred to as the ‘Schizophrenia Problem’ associated with human-computer interaction. Janney describes the essence of this problem as follows: “As a partner, the computer tends to resemble a schizophrenic suffering from severe ‘intrapsychic ataxia’ – the psychiatric term for a radical separation of cognition from emotion. Its frame of reference, like that of the schizophrenic, is detached, rigid, and self-reflexive. Interacting in accordance with the requirements of its programs, the computer, like the schizophrenic, forces us to empathize one-sidedly with it and communicate with it on its own terms. And the suspicion arises that the better we can do this, the more like it we become.” (Janney, 1997, p.1) Crucially, on his view, intrapsychic ataxia, is “a built-in feature of computers.” (Janney, 1997, p.4) Notwithstanding the intrinsic nature of the Schizophrenia Problem, Janney remains optimistic about the possibility of its (at least partial) ‘solution’ within cognitive technologies as is evidenced by his intent ‘to encourage discussion about what *can* be done in Cognitive Technology to *address* the problems pointed out [emphasis added].” (Janney, 1997, p.1) As he goes on to state, “an important future goal of Cognitive

Technology will have to be to encourage the development of computer technology that reduces our need for psychic self-amputation.” (Janney, 1997, p.5)

While concurring with Janney that “a one-sided extension of the cognitive capacities of the human mind – at the expense of the user’s emotional and motivational capacities – is technological madness” (Janney, 1997, p.1), it is maintained that if the Schizophrenia Problem is to be ‘solved’ - by which is meant elimination and not mere reduction of the need for psychic self-amputation – it will be necessary for Cognitive Technology to reconsider its position on the issue of replication of human cognition and emotion. Although efforts are underway in this direction, it is suggested herein that they are unlikely to prove ultimately successful. This is because the Schizophrenia problem can be shown to be intrinsically, if only partially, related to 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. For example, Picard (1997) has argued that the problem of synthesizing emotion can largely be bracketed from the problem of explaining (and possibly synthesizing) consciousness. However, as she is careful to point out, consciousness and emotion, while not identical, are “closely intertwined”. While current scientific (specifically, neurological) evidence lends support to the view that consciousness is not necessary for the occurrence of all emotions, Picard concedes that emotional *experience* “appears to rely upon consciousness for its existence.” (Picard, 1997, p.73) If consciousness is necessary for emotional experience, then in order to solve the Schizophrenia Problem, cognitive technologies must first solve the ‘hard problem’. This would seem to suggest that, contrary to one of the underlying assumptions of Cognitive Technology, replication of mind (cognition and emotion) –

arguably the central goal of AI (or Artificial Intelligence) – constitutes a necessary condition for IA (or Intelligence Augmentation).

In this connection, it might be argued that the thought of the German phenomenologist Martin Heidegger (1889-1976) - more specifically, that aspect of his early thinking concerned with the being (or ontology) of human beings as interpreted by Hubert Dreyfus - is highly relevant to Cognitive Technology in that it appears to suggest how the Schizophrenia Problem can be solved. According to Dreyfus (1991), Heidegger holds subjective experience to be grounded in, and thereby emergent from, a more primitive existential experience - *Dasein* or being-in-the-world - that is ontologically prior to subjectivity and objectivity. If Dreyfus' Heidegger is correct, then the Schizophrenia Problem is solvable because the 'hard problem' can be solved by constructing artificial *Daseins* capable of generating consciousness as an emergent phenomenon.

In this paper, it will be argued that appealing to Heideggerian thought in the context of attempting to solve the Schizophrenia Problem associated with cognitive technologies is problematic on (at least) three counts: First, Dreyfus' interpretation of Heidegger, or rather, technologists' selective appropriation of Dreyfus' interpretation of Heidegger, while (possibly) illuminating from a technological standpoint, can be shown to be distorting when viewed from the perspective of Heidegger scholarship. Crucially, this fact may be of more than merely academic significance; second, Heidegger's commitment to an empirical-realist conception of nature as intrinsically non-experiential can be shown to undermine the possibility of a Heideggerian 'emergentist' solution to the 'hard problem'; third, it is suggested that because the technical construction of artificial systems - in this instance, synthetic *Daseins* - occurs under an

implicit subject-object (or artificer-artifact) orientation, the primitive components of such systems will necessarily stand in extrinsic (or external) relation to each other. This fact is of critical significance since Heidegger holds that beings are relationally-constituted, thereby entailing a commitment to an ontology grounded in intrinsic (or internal) relationality.

In closing, it will be argued that since Heidegger cannot solve the ‘hard problem’, it is necessary to look elsewhere for a solution to the Schizophrenia Problem. In this connection, Whiteheadian panexperientialism seems promising in that it appears to solve the ‘hard problem’. However, this is at the price of a commitment to an ontology grounded in intrinsic (or internal) relationality which undermines the possibility for constructing artificial *Daseins* capable of consciousness, thereby rendering the Schizophrenia Problem unsolvable.

2 ‘THE DREYFUS AFFAIR’

Determining the implications of Heidegger’s thought for Cognitive Technology is arguably as difficult a task as determining his standing in Western academic philosophy: On the one hand, Heidegger is (generally) regarded as an intellectual charlatan of consummate proportion (and extremely dubious moral standing) by members of the Anglo-American philosophical establishment; on the other, he is (largely) revered as a genuinely original thinker who has contributed both profusely and profoundly to the enrichment of Continental philosophy. Similarly, on the one hand, Heidegger's later thought, in particular, his assertion that “the essence of technology is by no means anything technological” (Heidegger, 1977, p.4), has been regarded by anti-technologists

as establishing grounds upon which to mount a universal critique of technology; on the other hand, certain Heideggerian insights have been embraced by technologists in an attempt at resolving intractable problems of long standing. Although the claim that Heidegger has contributed significantly to the debate on the meaning and scope of technology is not, in itself, in question, determining the precise nature of his contribution(s) – in the present context, the implications of his thought for the development and critical evaluation of cognitive technologies - is problematic because there are many ways to interpret and appropriate his meditations on this issue by appealing to different ‘aspects’ and ‘phases’ of his phenomenological inquiry into being.

In this connection, Dreyfus’ (1972) seminal critique of ‘GOFAI’ (Good-Old-Fashioned-Artificial-Intelligence), which makes extensive use of the ‘existential analytic of *Dasein*’ (that is, the situated analysis of the onto-phenomenological structures of human being) presented in Heidegger's *Being and Time* (Heidegger, 1962) in order to contest the sufficiency of disembodied, a-contextual, symbolic computation as a means by which to instantiate real yet synthetic intelligence, has played an important, perhaps even decisive, role in motivating practitioners to consider engaged, embedded, and non-representational approaches to computing grounded (at least partly) in Heideggerian thought. It is crucial to appreciate at the outset that Dreyfus’ approach to AI critique was philosophical and not technological, being driven by a desire to draw attention to the perceived failings of an extant technology. Dreyfus’ primary concern was not - and, arguably, could not be, given his lack of technical expertise - to develop technological solutions to the problems of AI; this task was left to the technologists among his later followers. Connectionist approaches to consciousness (Globus, 1995)

and cognition (Clark, 1997), robotic approaches to artificial life (Wheeler, 1996) (Prem, 1997), and the (re)conceptualisation of the information systems paradigm in terms of communication rather than computation (Winograd and Flores, 1986) (Coyne, 1995) have all benefited from Dreyfus' engagement with Heidegger.

There are (at least) two points to note in connection with the above: First, 'The Dreyfus Affair' - that is, Dreyfus' engagement with Heidegger on the one hand, and with the AI community on the other - provides a relatively recent example of the social determination of technology, the specifically philosophical character of the determination calling into question more conventional theses on technological determinism; second, perhaps what is most significant and yet often overlooked, is the fact that Dreyfus' critique of AI was only finally acknowledged and subsequently integrated into technology theory and practice because it *could* be so incorporated. In short, it is maintained that Dreyfus - and thereby Heidegger - was eventually taken seriously by technologists because his interpretation of Heidegger allowed the technological project to continue.

While this appears to reverse the order of determination described previously, it is not this fact that is especially interesting since the reflexive nature of the relations of determination between society and technology has long been appreciated by sociologists and philosophers of technology. Rather, what *is* interesting, is the fact that Dreyfus' critique was ultimately regarded as both valid and relevant because it showed that an embedded developmental history of embodied engagement constitutes a necessary condition for 'coping' with the world in an intelligent manner. Crucially, as Olafson (1994) and others have shown, Dreyfus' notion of 'coping' is grounded in an instrumentalist-pragmatist interpretation of Heidegger's thought. However, as Blattner

(1992), Fell (1992), and, significantly, Dreyfus himself (Dreyfus, 1992), have all shown, instrumentalist, pragmatist and/or behaviourist interpretations of Heidegger's thought are both limited and 'dangerous' because partial and hence, distorting. According to Olafson, "it would be a pity if Dreyfus, who has done so much to refute the computer theory of human being, were to be in the painful position of seeing his own formulations give an illusory sense of affinity with Heidegger to people who are utterly at odds with his views." (Olafson, 1994, p.52) It is, therefore, somewhat ironic that Dreyfus, who has been charged with misappropriating Heidegger's thought on various grounds¹, himself ends up being misappropriated by practitioners of technoscience (AI, A-Life etc).

In summary, and philosophically speaking, 'The Dreyfus Affair' appears to be over.

3 HEIDEGGER AND COGNITIVE TECHNOLOGY

The implications of the end of 'The Dreyfus Affair' for Cognitive Technology are somewhat unclear since it is possible that Dreyfus' interpretation of Heidegger remains practically relevant despite its philosophical shortcomings. For example, the application of Heideggerian thought to cognitive technology with the latter interpreted as artificial (or synthetic) means by which meaning might be extended in the interaction between humans and machines appears warranted given (1) the identification of being with intelligibility or meaning, viz. *Sein* as *Sinn* (or sense), (2) the mutual dependency of being and *Dasein* (or being-in-the-world), (3) the ontological priority of *Dasein* over the conscious subject, and (4) the onto-phenomenological claim that being-with (*Mitsein*) other *Daseins* is a constitutive existential structure of *Dasein*. This is because (1)-(4) ostensibly provide the foundations of a framework for solving the Schizophrenia

Problem by allowing for an emergentist solution to the ‘hard problem’ that can be implemented by natural and artificial (or synthetic) *Daseins* alike. On this basis, it might be argued that it is necessary to shift the goal of cognitive technology from constructing ‘instruments of mind’ - what Heidegger would call *Zuhandenheit*, which Dreyfus translates as ‘availability’ (or that which is ‘ready-to-hand’) in reference to *Dasein*-centric, pragmatically-functional, transparent ‘equipment’ (*Zeug*) - to emergent construction of minded-instruments, that is, ‘instruments *with* mind’.

4 HEIDEGGER AND THE ‘HARD PROBLEM’ OF CONSCIOUSNESS

According to Schatzki (1982), 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*. (Kant, by contrast, is held to be a *transcendental* realist: On his view, what something is ‘in itself’ is what it is independently of any *possible* knowledge of it.) It is crucial to appreciate that empirical realism entails that the being of all beings, both human and non-human, is, in principle, publicly accessible to *Dasein* because this fact assumes critical significance when the ‘other-minds’ problem, that is, the problem of determining whether or not other beings are capable of consciousness (first-personhood, ontological subjectivity, private experience), is considered. The (later) Heideggerian solution to this problem involves recognizing the following as existential facts: (1) being-with other *Daseins* is a fundamental (or constitutive) structure of *Dasein*; (2) *Dasein* (as being-in-the-world) has primacy over consciousness; (3) both *Dasein* and consciousness are linguistically-constructed. On this basis, the ‘other-minds’ problem is discharged by observing that because (1) *Daseins* share language and (2) there are a

plurality of *Daseins*, therefore, a plurality of consciousnesses (or minds) is possible. However, it is important to draw out the full implications of this approach to solving the ‘other-minds’ problem: Heidegger is forced to conceive subjectivity in objective (or public) terms because, on his empirically-realist view, the subjectivity of a subject is disclosable, in principle, to and by other subjects. Since it is only *Daseins* that share language, only *Daseins* can become consciousnesses (or first-person, private subjects). Crucially, on his view, nature as it is ‘in-itself’ (that is, independent of *Dasein*) discloses itself ‘in a barren merciless’ as ontologically objective and hence, ‘absurd’ or meaningless. Heidegger (1962) insists that this view of nature is not grounded in a value judgement but reflects an ontological determination that follows from the fact that it is *Dasein* alone who gives being (intelligibility or meaning) to beings². However, this position is contestable on (at least) four grounds:

First, it is not at all clear that consciousness is a (purely) linguistic phenomenon, more specifically, an emergent linguistic artifact.

Second, more importantly, it does not follow from the fact that since *Daseins* are the only beings that share language, therefore only *Daseins* are capable of conscious (or at least some degree of private, subjective) experience. According to Krell (1992), life may constitute a sufficient existential condition for being a ‘clearing’ or ‘opening’, that is, a space of possible ways for things (including human beings) to be. While it might be conceded that the being (sense or meaning) of beings disclosed by *Dasein* is of a significantly higher order than that disclosed by (other) beings themselves, it simply does not follow from the shareability of language peculiar to *Dasein* that disclosure of being by other beings is impossible; human-centred meaning is not necessarily

coextensive with meaning as such. In short, Heidegger's position appears untenably anthropocentric.

Third, the view that nature is fundamentally 'vacuous' or non-experiential is an assumption which is undermined by the empirical fact that while experiential beings are definitively known to exist, it is unclear whether any non-experiential beings have, in fact, ever been encountered (Griffin, 1998).

Finally, Heidegger's dualism of meaningful subjects and meaningless objects gives rise to the 'hard problem' (Chalmers, 1996), that is, the problem of explaining how ontological subjectivity can arise from an ontologically objective substrate. Heidegger cannot avoid this problem because his empirical realism commits him to the view that science can, in principle, causally explain how things came to be the way they are (Dreyfus, 1991); clearly, this includes explaining how the brain - which Globus (1995) identifies as a necessary condition for *Dasein* - can give rise to consciousness. Emergentist solutions to the 'hard problem', which view consciousness as an irreducible systemic property arising from the interaction of components, none of which possess this property or properties categorially-continuous with this property in isolation or in other systemic complexes, are problematic because they disregard the principle of ontological continuity, arguably a cornerstone of scientific naturalism (Griffin, 1998)³.

5 POST-HEIDEGGERIAN ONTOLOGY AND COGNITIVE TECHNOLOGY

It appears then that Heidegger's engagement with cognitive technology, at least with respect to the relevance of his thought to the Schizophrenia Problem, is, like 'The Dreyfus Affair', at an end. Principally, this is because Heidegger cannot solve the 'hard

problem' due to what is, somewhat ironically, a phenomenologically-unsound (mis)conception of nature as intrinsically non-experiential. Thus, if the Schizophrenia Problem is to be addressed, it is necessary to consider 'post-Heideggerian' conceptions of the being of nature.

On Whiteheadian panexperientialism, for example, nature is held to be relationally-constituted and experiential at its most primitive ontological level. However, this does not imply that all beings are experiential in the same way (that is, ontological monism does not entail ontical monism); rather, certain complex beings enjoy a higher-level of experience relative to simpler beings. In addition, all complex beings belong to one of two kinds, experiential 'compound' (or 'societal') individuals or non-experiential aggregates, depending on the nature of their internal (or constitutive) relational organisation (Griffin, 1998).

Crucially, if Whiteheadian panexperientialism is the way that nature is in-itself then the possibility of constructing an artificial *Dasein* is radically undermined because artificing (construction, making) involves an orientation in which 'subjects' stand in ontological opposition to 'objects' (Heidegger, 1977), thereby 'rupturing' the nexus of internal (subjective, constitutive) relations constituting natural beings so as to establish - more precisely, impose - external (objective, non-constitutive) relations between 'primitives' (components) in the synthetic systemic complex (Ladrière, 1998). To the extent that *Dasein* is, ontically-speaking, a natural phenomenon⁴, its being must be internally-constituted; however, artificial systems are externally-constituted which implies that they cannot provide the necessary ontical (causal) substrate for *Dasein*. In short, genuine *Mitsein*, arguably a necessary condition for an emergentist solution to the

'hard problem' and, thereby, to the Schizophrenia Problem associated with cognitive technologies, cannot be generated technically.

6 CONCLUSION

If, as has been herein argued, the Schizophrenia Problem is unsolvable in the sense that the need for human psychic self-amputation cannot be eliminated completely but merely reduced in extent, it appears that cognitive technologies are faced with a choice: Either uphold the assumption of phenomenological symmetry underlying Janney's conflated conception of "the prosthesis as partner" and consider alternative technological prostheses other than the computer, or abandon this assumption and embrace a genuinely pragmatic - and Heideggerian - orientation to the computer taken as tool⁵. Irrespective of the choice made, Janney's project of "finding out where the prosthesis 'pinches', so to speak [since] progress will depend on discovering and describing the sources of sensory and psychic irritation at the human-computer interface" (Janney, 1997, p.5), remains both valid and important.

NOTES

1. For example, with respect to the question of whether Heideggerian phenomenology is anti-individualistic (Olafson, 1994), anti-representational in character (Christensen, 1997, 1998), and at least minimally consistent with some version of scientific naturalism (Christensen, 1997, 1998) (Pylkkö, 1998).
2. According to Fell, "[this] is one of the most problematic assertions in the entire Heideggerian corpus." (Fell, 1979, p.119)

3. It might be argued that the validity of this argument is called into question by the fact that “‘consciousness’ and its cognates are no longer part of Heidegger’s operative philosophical vocabulary. They have been replaced by a concept of existence as the mode of being of an entity for which the things with which it deals *are there* [*Da-Sein*], whether in the mode of perceptual presence or some other form of presence-in-absence.” (Olafson, 1994, p.52) Crucially, “if *Dasein* is a unitary entity defined by existence and presence and not a compound of body and mind, then it is utterly obscure how ‘consciousness’ could be reintroduced into it.” For this reason, Olafson maintains that “if the story of the demise of ‘consciousness’ and ‘mind’ had been told in a way that does full justice to the ontology that replaces mind-body dualism, this sort of *ad hoc* revision [in which *Dasein* ‘emerges as a conscious subject’] would be quite unnecessary.” (Olafson, 1994, p.52) However, if Heideggerian phenomenology is indeed a form of empirical realism, and if, as Dreyfus maintains, “later Heidegger could be called a *plural realist*”, that is, one who asserts that “there can be many true answers to the question, What is real?” (Dreyfus, 1991, pp.262-263) including a scientifically-naturalistic answer, and granted Heidegger’s ‘disenchanted’ conception of nature in both his early and later thinking, it follows that some such ‘emergentist’ revision as the one proposed by Dreyfus is necessary and yet insufficient as a solution to the ‘hard problem’.

4. On empirical-realism, specific natural - more precisely, biological - conditions are necessary, yet insufficient, for *Dasein* (Dreyfus, 1991) (Globus, 1995).

5. A similar position is adopted by Stojanov and Stojanoski (2001) who argue that computers should not be viewed as interlocutors (or dialogic agents) standing in a symmetric relation *with* human beings, but rather as asymmetrically-related cognitive

prostheses *for* humans. However, it is important to appreciate that their position is grounded in the assumption that interface ontology is metaphorical, an epistemological stance that conflicts with the ontological orientation of Heideggerian phenomenology in which how something is *taken to be* is constitutive of what that thing *is*.

REFERENCES

Blattner, W. D. (1992) Existential Temporality in Being and Time: (Why Heidegger is not a Pragmatist). In H. L. Dreyfus and H. Hall (Eds.), Heidegger: A Critical Reader (pp.99-129). Oxford: Blackwell.

Chalmers, D. J. (1996) The Conscious Mind: In Search of a Fundamental Theory. Oxford: Oxford University Press.

Christensen, C. B. (1997) Heidegger's Representationalism. The Review of Metaphysics 51, 77-103.

Christensen, C. B (1998) Getting Heidegger Off the West Coast. Inquiry 41, 65-87.

Clark, A. (1997) Being There: Putting Brain, Body, and World Together Again. Cambridge, Mass.: MIT Press.

Coyne, R. D. (1995) Designing Information Technology in the Postmodern Age: From Method to Metaphor. Cambridge, Mass.: MIT Press.

Dreyfus, H. L (1972) What Computers Can't Do: A Critique of Artificial Reason. New York: Harper & Row.

Dreyfus, H. L. (1991) Being-in-the-world: A Commentary on Division I of Heidegger's Being and Time. Cambridge, Mass.: MIT Press.

Dreyfus, H. L (1992) Heidegger's History of the Being of Equipment. In H. L. Dreyfus and H. Hall (Eds.) Heidegger: A Critical Reader (pp.173-185). Oxford: Blackwell.

Fell, J. P. (1979) Heidegger and Sartre: An Essay on Being and Place. New York: Columbia University Press.

Fell, J. P. (1992) The Familiar and The Strange: On the Limits of Praxis in the Early Heidegger. In H. Dreyfus and H. Hall (Eds.) Heidegger: A Critical Reader (pp.65-80). Oxford: Blackwell.

Globus, G. G. (1995) The Postmodern Brain. Philadelphia: John Benjamins.

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

Haraway, D. J. (1985) *Manifesto for Cyborgs: Science, Technology, and Socialist Feminism in the 1980's*. *Socialist Review* 80: 65-108.

Heidegger, M. (1962) *Being and Time*. Translated by J. Macquarrie and E. Robinson. New York: Harper & Row.

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

Janney, R. W. (1997) *The Prosthesis as Partner: Pragmatics and the Human-Computer Interface*. In J. P. Marsh, C. L. Nehaniv & B. Gorayska (Eds.) *Proc. Second International Cognitive Technology Conference CT'97: Humanizing the Information Age* (pp.1-6). IEEE Computer Society Press.

Krell, D. F. (1992) *Daimon Life: Heidegger and Life-Philosophy*. Bloomington and Indianapolis: Indiana University Press.

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

Olafson, F. (1994) *Heidegger à la Wittgenstein Or 'Coping' with Professor Dreyfus*. *Inquiry* 37, 45-64.

Picard, R. W. (1997) *Affective Computing*. Cambridge, Mass.: MIT Press.

Prem, E. (1997) *Epistemic Autonomy in Models of Living Systems*. In P. Husbands and I. Harvey (Eds) *Fourth European Conference on Artificial Life* (pp.2-9). Cambridge, Mass.: MIT Press.

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 H. L. Dreyfus and H. Hall (Eds.) *Heidegger: A Critical Reader* (pp.81-124). Oxford: Blackwell.

Stojanov, G., Stojanoski, K. (2001) *Computer Interfaces: From Communication to Mind-Prosthesis Metaphor*. In M. Beynon, C. L. Nehaniv, and K. Dautenhahn (Eds.) *Proc. Fourth International Cognitive Technology Conference CT'2001: Instruments of Mind* (pp. 301-310). Berlin: Springer-Verlag.

Wheeler, M. (1996) *From Robots to Rothko: The Bringing Forth of Worlds*. In M. A. Boden (Ed.) *The Philosophy of Artificial Life* (pp.209-236). Oxford: Oxford University Press.

Winograd, T., Flores, F. (1986) *Understanding Computers and Cognition: A New Foundation for Design*. Reading: Addison-Wesley.