

# Exploring Mind-As-It-Could-Be: From Artificial Life to Artificial Embodiment<sup>1</sup>

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In this position paper I want to suggest that we are witnessing the birth of a new research paradigm in cognitive science. How so? Let me begin by drawing our attention to a recent technological development which, as an explicit part of its agenda, envisioned a change in scientific practice itself: the field of *Artificial Life*. One of its founders, Chris Langton, describes this project as follows:

By extending the horizons of empirical research in biology beyond the territory currently circumscribed by life-as-we-know-it, the study of Artificial Life gives us access to the domain of life-as-it-could-be, and it is within this vastly larger domain that we must ground general theories of biology and in which we will discover practical and useful applications of biology in our engineering endeavors. (C. G. Langton, <http://www.biota.org/papers/cglalife.html>)

The methodology of Artificial Life (AL) consists of two essential aspects: (i) it is *synthetic* – the phenomena to be investigated first need to be created artificially, and (ii) it is *analytic* – the phenomena, once they have been generated, are in need of further analysis. The synthetic aspect is usually implemented by means of simulation or physical models, while the analytic aspect is typically approached by means of dynamical systems theory. It is important to emphasize that both aspects are indispensable: without (i) there is no phenomenon to be explained, and without (ii) there can be no explanation.

The methodology of AL has resulted in various existence proofs, thought experiments illustrative models, and subversions of presuppositions, many of which have been influential in cognitive science. However, its methodology is inherently limited to the study of external, third-person mechanisms and principles. As such, it cannot inform us about the most puzzling phenomena currently facing cognitive science, namely the *qualitative* aspects of being a living, cognitive, and conscious agent. This is unfortunate because the ‘what it is like’ questions are starting to become increasingly important in cognitive science: What is it like to develop and master a bodily skill? What is it like to perceive? What is it like to encounter another subject?

Nevertheless, I want to argue that we are in the middle of another technologically-inspired development, one which can systematically complement the methodology of AL in this particular respect. I propose to call this emerging field *Artificial Embodiment*.

Under the label of Artificial Embodiment (AE) I understand a methodology that enables us to go beyond the study of embodiment-as-we-know-it, in order to access the domain of embodiment-as-it-could-be. More precisely, by building on the assumptions that the mind is embodied, and that by systematically changing our embodiment we can systematically change our experiential states, the aim of AE is to access a larger domain of mental

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phenomena, i.e. *mind-as-it-could-be*, so as to ground general theories of cognitive science and, of course, reap some technological benefits along the way. The methodology of AE is essentially similar to the one familiar from AL:

- (i) The methodology is *synthetic*: The phenomena of interest are not naturally occurring and need to be artificially produced by technological means. Here it is possible to draw on the work that has already been going on in research into enactive interfaces, sensory augmentation, sensory substitution and perceptual supplementation. The more minimalist and systematically adjustable, the better.
- (ii) The methodology is *analytic*: The experiential phenomena generated with this technology are in need of further analysis to become the basis for scientific explanations. Here we can draw on the work that has already been going on in terms of first- and second-person approaches to consciousness studies. The more recordable detail about the genesis and unfolding of a phenomenon, the better.

The synthetic aspect of AE is a variation of the increasingly familiar ‘engineering for emergence’ theme in synthesizing AL. In other words, we want to design interfaces that couple with our bodies such that this body-technology interaction gives rise to a specific experience. The nature of this interaction can vary: augmentation, substitution, enaction, and deprivation are all possibilities. What matters most is that our bodily ways of engaging with the world can be systematically altered. Other important factors to consider include that the interface is cheap, non-intrusive, and requires little training time. Minimalist designs can usually satisfy these requirements while at the same time being easier to replicate by other researchers.

Replication is a crucial element of the scientific process in general, but it is even more so in the case of AE, where scientific verification might need to include undergoing the target experiential phenomenon oneself from the first-person. Otherwise there is a danger to get caught up in ungrounded debates, such as whether the experience of using TVSS is vision, vision-like, a form of touch, touch-based inference, or actually constitutes a novel perceptual modality. This also puts some constraints on the analytic methods employed by AE. It is impossible to expect all researchers to undergo the long and difficult process of training to become experts at becoming aware and describing their experience. To be sure, this constraint makes second-person approaches especially attractive.

For AE to impact on cognitive science, it is important to develop systems that, while minimalist in design, still raise issues of genuine scientific interest. At this workshop we present one such interface, the *Enactive Torch*, a distal-to-tactile sensory augmentation device that was designed specifically for this purpose (Froese & Spiers 2007)<sup>2</sup>. While this interface instantiates only a single, continuous parameter of body-technology coupling, it nevertheless provides a platform to investigate the development of bodily skills and perceptual modalities, the exteriorization of stimuli, and as well as cross-modal influences. Interestingly, the latter influences were only discovered during a debriefing interview, where it turned out that motor sounds structured the perceptual space afforded by the device. This anecdotal evidence points to the need for the synthetic and analytic aspects of the methodology to be tightly related in a mutually informing manner.

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<sup>2</sup> Froese, T. & Spiers, A. (2007), “Toward a Phenomenological Pragmatics of Enactive Perception”, in: *Enactive/07: Proc. of the 4<sup>th</sup> Int. Conf. on Enactive Interfaces*, Grenoble, France: ACROE, pp. 105-108