The Evolution of the Extended Mind: From Man-Computer Symbiosis to the Web

Harry Halpin
Center Leo Apostel, Vrije Univerteit Brussel, Brussels, Belgium, hhalpin@ibiblio.org
https://ibiblio.org/hhalpin

The question of bio-machine hybrids raises to its proper philosophical stature the nature of some increasingly pressing concerns that were once regulated to speculative fiction. What about us crucially changes when we replace our flesh-and-blood arm with a robotic arm? Or, as predicted by Google CEO Eric Schmidt, when our brain is directly interfaced with Google via a neural implant? Yet the fantastic vision of seeing a human with a mechanical arm or a chip implanted directly in their brain actually can cause a type of picture-thinking that obscures a crucial philosophical question: What are the precise conditions that form a biological and technological hybrid in the first place? Despite the hype about neuro-prosthesises and cyborgs, in what ways was does –or does not – the more mundane example of a human using a Web-enabled smartphone exhibit some degree of bio-machine hybridization, a Web-extended Mind? With the advent of glasses that directly wire into Google, perhaps such costly implanting of a chip into the brain may not even be necessary.

How do we know if a given human and a technical apparatus count as a bio-machine extended intelligence? We posit an answer by appealing to the Extended Mind Hypothesis (Clark and Chalmers 1998), which can be iterated to produce a number of fairly straightforward conditions that can determine whether or not a particular relationship between a given human and their technologies qualify as a fully cognitively-extended bio-machine hybrid, with the caveat that we assume (for humans at least) any interesting bio-machine hybrid would also have to qualify as cognitive. Interestingly enough, this argument will show that actual cognitive extension does not require the direct interfacing of flesh and machine (although that can of course, possibly help), so that genuine cognitive extension can take place in the much more common-place scenario of the aforementioned smartphone.

This still leaves in place the idea of (a possibly unique convergence) between the biological and technological, as predicted by various proponents and detractors of the Singularity Hypothesis (Kurzweil 2005). Counter this idea that a bio-machine hybrid as a newcomer on the historical scene, we argue that the relationship between the biological and technology is best seen through of as what may be a termed co-evolutionary lens, where to use the slogan from Andy Clark, where humans have always been "natural-born cyborgs." (Clark 2010) Bio-machine hybrids such as Google Glass are the result of a fairly long, if philosophically under-rated, technological exploration of man-computer symbiosis and human augmentation articulated by Licklider and Engelbart in the 1950s, a historical trajectory we explore in some detail in order to prove our point. So our larger argument is that the winding path to cognitive integration follows reading of evolution that follows the work of philosophers such as Daniel Dennett who conceive of evolution as an abstract algorithm (Dennett 1995) and of historian of technology George Basalla who tries to apply such an evolution to technical artifacts (Basalla 1985).

The Extended Mind Hypothesis states that under certain conditions parts of the outside environment, such as technology, may qualify as part of the mind in some strict sense (Clark and Chalmers 1998). The paradigmatic example is Otto, who due to being damaged with some kind of neurological short-term memory loss, can only to navigate his way to the Museum of Modern Art (MOMA) with the aid of a notebook. It is claimed by virtue of what Clark and Chalmers term "the parity principle" that the notebook be given some of the cognitive credit despite being outside boundaries of the brain and skin (Clark and Chalmers 1998). Despite its seemingly strange implications, the Extended Mind Hypothesis is a straightforward extension of standard philosophical accounts of functionalism, so that any function that fulfills a cognitive role should count as genuinely cognitive regardless of what substratum a particular function is implemented on, be that biological or technological. The standard objection would be that the notebook can not count as part of the mind due to some characteristic or another that renders it obviously non-cognitive, such as being made of paper rather than neurons. What matters may not be "where" a function is located, but whether or not it fulfills some criteria that justify it being part of a cognitively integrated whole system. To briefly iterate the criteria for cognitive extension including (but not limited to) technology,

a summary of the conditions given in Clark's previous work is useful (Clark 2010). The technology that fills the functional role must be *portable*, so that capabilities that count as part of the extended mind are accessible when needed. This does not mean they are always accessible, but simply accessible under when needed. Even our biological mind may "forget" incidents and facts, and under non-normal conditions we may suffer brain damage after a catastrophe such as an automobile accident. The second criteria is that the technology must be *robust*, so that capabilities are present when needed, but that the function works consistently and within the needed time-frame necessary to solve problems. Having access to a French dictionary doesn't count as knowing French unless one can fluently respond to a French question in the socially appropriate time-frame. The third condition is that such a technology must be augmented by providing a genuinely new capability, significantly augment an existing capability, or replacing a missing capability. In Otto's case, the notebook replaces his working memory, but for many of us notebooks (or smartphones, and perhaps one day implants) also augment our memory by allowing more precise recall of maps, phrases, and other items that escape our biological memory. Lastly, the technology must be dove-tailed, or in other more controversial terms "evolutionarily co-adapted" (Clark 2010). This means that a new capability grows and changes in such a way that it becomes adapted to face the problems facing the reproduction of the extended cognitive assemblage, and so is automatically trusted and endorsed, even if not "consciously" endorsed, as originally argued (Clark and Chalmers 1998).

We can apply these four characteristics to a range of technologies, which we can term *cognitive technology*. No technology is guaranteed to be a cognitive extension, but is only given as one in lieu of a particular well-defined problem. Given that a multitude of technologies may count as cognitive extensions under differing conditions, the key point to that there is no "essence" of the human, but that the mind is constantly assembled from differing configurations of biological and technical components in a given environment that can be described adequately described as a cognitively integrated whole. What we need is a good running example of a successful technology, and for this we'll choose the World Wide Web. This will help us make concrete our earlier rather abstract claims connecting the Extended Mind with evolution, as we admit the Extended Mind is hampered insofar as its analytic approach is itself remarkably atemporal. Can we imagine how the Extended Mind hypothesis would play out over the time-scales involved in the reproduction of a species ... or a technology? To extend the Parity Principle to technology (Clark and Chalmers 1998), if some technologically component is essential in completing some functionally important role in the reproduction of a replicator then we should at least consider give that technological component its Darwinian due and classifying it as part of what Dawkins considered "the extended phenotype" of the replicator, in other words, "all the effects of the gene upon the world." (Dawkins 1982). We'll walk through the co-evolution via these lens of cognitive technology, from the original work of Douglas Engelbart to Licklider's Man-Computer Symbiosis to the Internet and the Web itself.

Basalla, G. (1985). *The Evolution of Technology*. Rhode Island: University of Delaware Press.

Clark, A. and Chalmers, D. (1998). *The Extended Mind.* Analysis, 58 no. 1:7–19.

Clark, A. 2010. *Supersizing the Mind*. Oxford: Oxford University Press.

Dawkins, R. (1982). *The Extended Phenotype.* Oxford: Oxford University Press.

Wilson, R. A. (2010) Meaning Making and the Mind of the Externalist. In R. Menary (Ed.), *The Extended Mind.* Cambridge: MIT Press.