

What future for human-machine symbiosis?

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„The main value of prediction is the amusement it will afford to those who live in the future.“

Preamble

Humans are a species like no other. They are self-symbiotic. By this I mean that the primary control upon their own evolution is the technology that humans use to create the environments which they inhabit. For the majority of human existence, these effects have been distal and indirect since they have been expressed almost exclusively as manipulations to the external world. Technology has been expressed primarily in material form, although properties such as knowledge and accumulated information have become manifest as more emergent, relational phenomena. Slowly at first, but more quickly now, the physical differentiation between user and machine has begun to dissipate (Licklider 1960). While exogenous appendages still predominate, the insertion of physical prosthetics into the body, largely for medical and

prophylactic reasons is now a commonplace occurrence. Cyborgs walk among us, albeit imperfectly integrated versions of either the idealized or nightmare visions of science-fiction writers. It is now the case that the 'evolution' of the human race is almost totally contingent upon this marriage with the machine, while change enacted on human beings from traditional sources of adaptation are negligible by comparison. In a piquant way, Darwin won the scientific battle but Lamarck triumphed in terms of practical effect! Given the reality of these circumstances, it is essential that scientists who mediate between humans

and machines continue to ask themselves about the possible futures of this self-symbiotic partnership.

Symbiosis: from form to function

True symbiosis is not species convergence of the component partners. Therefore, we should not try to uniquely build machines that perfectly replicate human skills, neither should we train nor constrain people to respond like machines. Rather, symbiotic evolution is largely contingent upon improvements in partner communication. Thus, the primary proximal problem is the extraction and interpretation of brain-generated signals and the subsequent integration of these signals with machine function. Since the machine is by far the more labile and malleable entity, and still remains the one upon which purpose is imposed rather than that from which it is derived, it is the machine that is the partner which will

continue to experience the greatest change in structural form. At present, we are seeking to create interfaces which make direct contact with brain tissue (see for example Hochberg et al. 2006) and conversely, experimenting with neuronal-level tissue attached directly to individual micro-chips (e.g., Voelker & Fromherz 2006). These nascent efforts seek to perfect the full symbiotic perception-action cycle in which the emergent unit of analysis is the human-machine dyad and not either human or machine individually (Hancock 1997).

One great problem in this search is the barrier of human empathy. The unity of con-

consciousness and the certainty of the termination of that individual consciousness in the future (i.e., the certainty of individual death) are the fundamental characteristics of individual human beings. Fully-realized human-machine symbiosis threatens the blessing of both of these facets of our essential existence. Already our children multiplex happily and modern exogenous communication devices induce a much greater level of collective consciousness than we have ever before experienced. What happens when such communication is in-dwelling and omni-present? Will the borders of privacy and individuality be technologically mediated? If so, who or what is in control of these boundaries and when is this control exercised (see Hancock & Szalma 2002)? How will the individual and collective 'will to power' be expressed in these circumstances? As with all emergent properties, the great likelihood is that there will be unanticipated effects which derive from the interactions involved. It is not the linear extrapolation of contemporary trends that represent useful predictions of the future but the illumination of the shadows of non-linear effects.

Summary

The brain is the single most complex organ of which we are presently aware. Ho-

wever, the way which it assimilates information and subsequently directs action seems more limited than our desires express. To effect greater ranges of action, the brain can join with its peers in social interaction but gesture and language are again apparently, frustratingly slow compared to the speed of thought. Fracturing some of these apparent rate-limitations and intrinsic barriers between human and human, and human and machine now seem synonymous with 'progress' (although the purported 'arrow of time' makes this perspective almost inevitable). However, the dichotomy of the individual and the collective is not solved by the fractionization of the boundaries of what we call the human and what we call the machine. We are truly a species like no other. It may well be that the emergent entity of the integrated human-machine system will become the unit of evolution itself. This line of development promises a radical departure from how we have perceived ourselves up until now. It begs the question not **can** we do this but **should** we do this? Statistically and historically, the most probable outcome is that this union will destroy itself and pass into extinction before a new stable state of transient equilibrium can be achieved. As a general observation, it is doubtful that the Universe will notice.

References

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