Post-Human Design: The Crafted Human Body and the Exoself

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> Sometimes he isn't certain he's still human; too many threads of his consciousness seem to live outside his head, reporting back whenever they find something interesting . . . And it's too early for anyone out there to be trying to hack exocortices... isn't it? Right now, the external threads of his consciousness are telling him that they like Annette....
> — *Charles Stross, Accelerando 2005.*

How Chinese censorship made me aware of my extended self

In 2006 I attended a bioethics conference in Beijing. Wikipedia was censored: the requested pages did not show up or I got an error message. Because of this, I became aware that while working or otherwise using my computer I was nearly *constantly* checking things in Wikipedia. The failures caused my attention to be drawn to what had until then been an unconscious habitual process. I was automatically requesting, reading and presumably using information in ways that my central, conscious self was up until this point unaware of.

This episode is reminiscent of the 'Otto's notebook' thought experiment about extended cognition.[1] If Otto, who suffers from Alzheimer disease, can function and remember normally thanks to noting down everything he needs to remember in his notebook, does it not make sense to argue that it is as much part of his memory as the memory-related brain tissue of a normal person? Adherents to the extended mind hypothesis would agree,

[1] (Clark & Chalmers 1998).

and would presumably also agree that Wikipedia should be counted as a part of my memory. An external, cloud-based public memory being updated by a vast community of editors and subject to government censorship. Yet to me, at least when I seamlessly access it, it feels like *my* knowledge.

Wikipedia is an example of an *exoself*, which I define as 'systems linked to the self in a cooperative way, extending the mind and the body'. Exoselves can blur the border between the core self and the world, although in many cases we are rarely confused or aware of the blur. To the biker the leather coverall and bike join with her to a wider system of speed, yet become separate objects when not needed or malfunctioning. While many exoself parts are everyday objects we do not normally ascribe high symbolic value to, others are symbols of the future.

In this chapter I will argue that exoselves are often the focus of a vision of futuristic, post-human redesign of our bodies, minds and selves. The term originated in science fiction but has spread to actual projects. These exploit the fact that our selves are already fuzzy, modular systems that are easily extended with external artefacts. This includes many everyday technologies like clocks, but also wearable computers -- systems that were explicitly constructed for expansion of human mental capacities in a vision of enhanced humanity. Often these exoself devices act as cybernetic regulators, monitoring action and promoting 'virtue', which can easily backfire when the full existential and social context is not taken into account. Yet the vision of a vastly extended self is a strong current in futurism and likely to drive much experimentation.

Exoselves

The term 'exoself' originates from Greg Egan's 1994 novel *Permutation City*, where it denotes the sophisticated supervisory software that supports a digital mind online: it is able to provide information, monitor mental state, change it, and control its virtual environment as desired.[2] The term recurs in his later novels. I slightly redefined it into the wider definition above when writing my 'Transhumanist terminology' webpage;[3] the usage

[2] Greg Egan, *Permutation City* (London: Orion/Millennium, 1994).
[3] www.aleph.se/Trans/Words/

appears to have spread from Egan's novels and my webpage in wider transhumanist and science fiction circles.

For example, it shows up in Ron Hale-Evans's *Mind Performance Hacks* where he states that 'I'd give a lot for a mental exoskeleton that I could program one day to make me less lazy the next day, and keep me from getting sucked into a cult or pyramid scheme the day after that'.[4] He sadly notes that we currently lack the technology to build an exoself as good as the fictional ones but turns to the task of using index cards and a periodic alarm device to construct an exoself system, concluding 'Sure, it's more like a child's crayon drawing of an exoself than the real thing, but it could be your head start on the Singularity'.[5] As we will see, this image of the exoself as not just something instrumentally practical but as an invocation of futurity is a recurring theme of exoselves, even when they are not labelled as such.

Neil Harbisson is a color-blind artist who developed a device that converts color into tones. Installed in a camera on an antenna on top of his skull, it continually produces a sonification of the colors of the environment. Like other sensory substitution devices, continual use makes the user able to interpret the signals; the brain adapts to the stream of input and develops representations that are meaningful. The antenna is surgically attached and he has argued legally and successfully that the device is a part of him.[6]

Exoselves inhabit the same discourse domain as cyborgs and human enhancement. A cyborg consists of artificial parts forming an integrated whole with an organism, while an exoself is a *part* that extends the *selfhood* of a person. Cyborgs may have parts that do not partake of a sense of self, and exoselves may be virtual and functional entities that are not strict parts. Cyborgs are often used to denote a disruption of traditional human/machine categories, while exoselves denote a disruption of the traditional self/non-self categories. Yet these categories have always been fuzzy.

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[4] Ron Hale-Evans, Mind Performance Hacks. Tips & Tools for Overclocking Your Brain (Sebastopol: O'Reilly Media, 2006), 63-6.
[5] Hale-Evans, Mind Performance Hacks, ….
[6] (Else 2012; Davies 2012).

Fuzzy selves

The borders around our selves have always been rather fuzzy. While strict philosophical definitions of the self as the conditions of identity that make one subject of experience distinct from all other subjects focus on general conditions, the practical psychology of our selves is highly contingent on our neurological state, what kind of personal identity model we believe in, where we draw our personal borders and attributions -- and increasingly, what external systems we incorporate into our extended selfhood.

The idea that our selves are not just static or eternal entities but actively constructed has been a growing theme in both philosophy and psychology. In Western philosophy we can trace it from Hume's bundle theory of self, over Parfit's relation of psychological connectedness and Dennett's 'centre of narrative gravity' to Chalmers and Clark's extended mind hypothesis and cognitive extension.[7] In psychology we find accounts such as William James's observation that:

> The Empirical Self of each of us is all that he is tempted to call by the name of *me*. But it is clear that between what a man calls *me* and what he simply calls *mine* the line is difficult to draw. We feel and act about certain things that are ours very much as we feel and act about ourselves. Our fame, our children, the work of our hands, may be as dear to us as our bodies are, and arouse the same feelings and the same acts of reprisal if attacked. And our bodies themselves, are they simply ours, or are they *us*?[8]

Sigmund Freud echoes this in his 'prosthetic God':

> With every tool man is perfecting his own organs, whether motor or sensory, or is removing the limits to their functioning . . . Man has, as it were, become a kind of prosthetic God. When he puts on all his auxiliary organs, he is truly magnificent; but these organs have not grown on to him, and they still give him trouble at times . . . Future ages will bring with them new and probably unimaginable great advances in this field of civilization and will increase man's likeness to God still more. But in the interests of our investigations, we will not forget that present-day man does not feel happy in his Godlike

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[7] Parfit (1984); (Dennett 2007); (Clark & Chalmers 1998; Clark 2008).
[8] (James 1890, ch. 10).

character.[9]

Weber views the self as a conglomeration of parts that can and will be reassembled and reinvented through psychological, social and biotechnological actions.[10]

These critiques of an atomic self make the extensible self a natural part of the human condition rather than something technological. It is very similar to how Dawkins's 'extended phenotype' emphasizes that organisms to function create not just bodies but phenotypes that encompass parts of their environment.[11] A forerunner was Kapp's theory of technology as *Organprojektion,* where technology does not just extend physical organs but also can be an extension of mental life.[12] Possessions commonly extend selves, something that has not escaped the notice of marketers.[13] What makes exoselves interesting is that they are not merely extensions of bodies but extensions of abilities, new feedback loops, new ways of thinking about ourselves.

One apparently useful way of dividing attempts at human (cognitive) enhancement is into internal and external devices or interventions, and into hardware or software. This at first appears to fit our mental categories that make internal hardware interventions (implants, drugs, brain stimulation) more concerning than external hardware (smartphones, tools), internal software (training, memory arts) and external software (Wikipedia, mathematics software).

The problem quickly arises that from a philosophical stance it is not clear why we should treat hardware differently from software, nor why the skin boundary is so special. In learning how to read and write, our brains are irreversibly reorganized in ways that change our language perception, brain structure[14] and make us unable *not* to see text in our language as words. Training reorganizes our brains on an organic level.[15] We adapt our

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[9] Sigmund Freud, *Civilization and Its Discontents*.
[10] Weber (2001).
[11] Dawkins (1982).
[12] Kapp (1877).
[13] (Belk 1988).
[14] (Petersson et al. 2007).
[15] Maguire et al. 2000).

bodies and minds to external tools, whether through calluses, changes in eyesight, or changed space perception when we hold tools.

When touching something with a tool, our awareness is typically not of the pressures on our hand but at the interaction at the tool-tip. As argued by Gibson, the resolution of this apparent paradox (since we lack sensory neurons inside the tool) is that the categories of environment and observer are not distinct.[16] Perception involves not only the sensory organs and brain, but how they interact with the world as a wider system to gain information -- the environment provides many functions used in the perceptual process. Our perception of a tool changes fundamentally when we grasp it from an external object to a part of our perceptual/action system. Non-living tools for perception are surprisingly common across the animal kingdom.[17]

Tools are not merely extending our sensory world but also our body schema, which is constantly maintained and updated. In experiments with monkeys, the use of a rake to reach distant food made neurons that normally are sensitive to both touch stimuli on the hand and visual stimuli near the hand update their sensory fields to encompass the entire length of the tool -- but not when it was merely passively held. Other neurons were sensitive to visual stimuli inside an arm's reach; with a tool they responded to the wider combined reach. Similar effects have been observed in humans, supporting the idea that tools become incorporated in our neural representation of our body and its relationship to space.[18]

Our body images and schemas are also easily manipulated through various illusions. Virtual reality can change our sense of where we are. 'Body swapping' where one experiences being a virtual (or somebody else's) body rather than one's own can be induced by bottom-up sensory tricks where stimuli override the top-down knowledge of where one resides.[19] Experienced body size and body satisfaction can be manipulated,[20] perhaps even changing the memory of the body.[21]

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[16] Gibson (2014)
[17] (Burton 1993)
[18] (Maravita & Iriki 2004).
[19] (Ehrson et al. 2005; Petkova & Ehrson 2008)
[20] (Preston & Ehrsson 2014)
[21] (Serino et al. 2016).

The relevant issue here is that cognitive and self-defining process can be complemented, augmented and transformed by environmental frameworks. The deeper controversies about whether the environment must be regarded as a source of cognition and whether cognitive processes are *truly* 'out there' in a metaphysical sense are beyond this chapter.[22] It is enough to note that our *sense* of self is highly embodied and often extended.

Given these considerations it is not surprising that we can easily extend our sense of selfhood to tools that link to us in the right way, even if they do not breach the skin. Exoselves make use of our affordances in extending ourselves.

Human extensions

Humans have used intimate tools such as clothing and glasses for ages. Often these tools become part of our standard presentation beyond their instrumental uses. Presentation of the self is not the same as an externalized self.[23] Yet we rarely maintain tight mental boundaries, and self-image is often shaped by how we present ourselves. Hajo Adam and Adam Galinsky demonstrated 'enclothed cognition' where wearing a lab coat increased sustained attention, and more so when it was labelled as a 'doctor's coat' compared to when it was labelled as a 'painter's coat'.[24] It is not just the physical experience of wearing the clothes but their symbolic meaning that affects us.

A more explicit exoself part is the watch. Watches extend our time sense usefully beyond biological precision yet also function as a simultaneously unobtrusive and self-expressing accessory. Wearing a watch not only signals conscientiousness but actually predicts punctuality.[25] The watch is

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[22] (e.g. see Adams & Aizawa 2001; Clark 2008).

[23] An amusing exception may be the imagery of superhero stories, where the skin-tight suits leave them nearly naked despite their empowered status (Ryan 2014, p. 37-39) and yet act as iconic stand-ins for their identity. Indeed, many superheroes and supervillains not only gain identity and power from their suits and other exoselves but in a sense *are* them (e.g. Venom, Dr Octopus, Iron Man, Dr Doom). The world of superhero stories acts as a modern future-oriented mythology where exoselves are a recurring theme.

[24] Hajo Adam and Adam Galinsky (2012)

[25] (Ellis & Jenkins 2015)

of course merely the wearable (and hence enabling) instance of a more general part of the industrial-era exoself: the ubiquitous clock. It extends our awareness of time and timing, alarm clocks discipline and standardize our awakening or cooking, and automated timestamping makes ordering of events clear: using clocks we can coordinate a complex society. Indeed, one of the key reasons watches made the cultural step from women's accessories to masculine tools was the military use of watches to synchronize troops beyond normal human ability.[26] Calendars, and especially digital calendars, allow not just extended prospective memory and timekeeping, but scheduling and reminding patterns years in advance -- as well as recalling past events indefinitely.

'Smart' alarm clocks attempt to create a feedback loop where the disciplining effect is softened by adaptation to individual sleep rhythms, making the diurnal rhythm a joint human-machine cybernetic problem. Ambitious people seeking more awake time -- usually the same people interested in other forms of technologically enhanced living -- may employ polyphasic sleep schedules (multiple short naps rather than one sleep period every 24 hours), maintained using external software. As we will discuss below, this self-disciplining use is a common application of exoselves.

In her magnificent review of wearable technology Susan Elizabeth Ryan makes the point that it -- whether smart clothes, smart watches, wearable computers or smart phones -- has multiple origins and uses, ranging from utilitarian military applications to aesthetic flights of fancy, from artistic critique to consumerist must-haves. But there has nearly always been a futurist framing as benign, imminent technology: 'The implication always is that this future is on our doorstep, and perhaps it is'.[27]

Are these extensions benign? It is obvious that we often relinquish agency for very small rewards, becoming integrated into systems of control. As discussed below many wearable devices act as disciplining methods imposed by the socialized high-order desires of the wearer (efficiency, health, self-control). Exoselves can be monitored and controlled by corporate and government interests, are manipulable by third parties, and sometimes mesh parasitically with our social lives (consider fitness trackers

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[26] (Brozek 2004; Friedman 2014).
[27] (Ryan 2014).

that stimulate exercise by making us compete with our friends) or cause disruptions. Yet many of the wearable technologies discussed by Ryan are multi-layered, developed for individualistic purposes, and acting as a form of speech – but these are often the one-of-a-kind artistic or experimental future-oriented wearables. The commodity devices are often far more conformist.

How does wearable technology become exoselves?

While many wearables are not intended nor function as exoselves -- sometimes a jacket is just a jacket -- many of the most iconic or discussed wearables are. Military head-up-displays (HUDs) project information to the soldier as needed, and soon became a staple of science fiction depictions of enhanced perception where characters navigate an information-saturated environment. Taking this to extremes, exoskeletons, whether intended for soldiers or nurses, have long fueled the imaginary of robotic suits (especially the Japanese mecha genre) where the robotic self is often depicted as either the enlarged self of the wearer, or a new emergent organism. The multitude of wearable self-tracking devices become an exoself thanks to the quantified self community framing it as such.[28]

[28] Melanie Swan, 'The quantified self: Fundamental disruption in big data science and biological discovery', *Big Data* 1, no. 2 (2013), 85-99.

Figure 1: The author with his wearable computer, ca 1998. This includes a Private Eye 320 x 200 pixel monochrome HUD, a Twiddler one-hand chord keyboard, and a Toshiba Libretto 50 PC.

Wearable computers emerged partially as technological pranks: Edward O. Thorp and Claude Shannon developed a hidden worn system for predicting roulette wheel outcomes 1955-1961;[29] they were followed in the 1970s by J. Doyne Farmer and Norman Packard.[30] In both cases the systems were closely and multimodally integrated with the body and linked to accomplices. As technology became cheaper and more versatile clusters of students and researchers at MIT, CMU and Georgia Tech began exploring

[29] (Thorp 1998
[30] (Bass 1985).

the idea of general wearable computers for augmenting humans.[31] Thad Starner, one of the key members of the network, wrote:

> People look at me strangely when I walk down the street these days. However, I'm not particularly surprised; I have a box strapped to my waist with wires reaching out to my hand and up to my eye. I often hold silent conversations with myself, electronically taking notes on the world around me. Occasionally one of my observations triggers electronic memories and gives me new insights. No wonder people look at me strangely. You see, I'm one of the world's first cyborgs.
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> We are on the edge of the next stage of human development: the combination of man and machine into an organism more powerful than either.[32]

Starner outlined many possible applications but in particularly focused on augmented memory: using a 'remembrance agent' that autonomously searched through one's personal (and public repositories) of information for entries relevant for the current situation information could be brought to mind seamlessly and unobtrusively.[33] This function was explicitly seen as an extension of the person:

> Furthermore, through this intimate, interactive relationship with the user, the Remembrance Agent can more easily learn the user's preferences. . . . This would allows a revolutionary concept in the computer world: a life-long relationship between a user and a particular machine interface. As the machine and user adapt to each other over the years, a new, integrated being might emerge combining the best features of both. Imagine a policeman who never forgets a face (adding a digitizing camera and simple face recognition software), an architect who never forgets a structure, or a history teacher who remembers everything he has ever read or been taught.

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[31] (Ryan 2014, ch. 2
[32] (Starner 1994)
[33] (Rhodes 1996).

The importance of a life-long relationship is a central one for exoselves, since integration takes time. We have already seen it in the exoself of Harbisson, and it recurs in many of the other systems.

The vocabulary in Starner's manifesto draws strongly on a longer tradition of external supports for the intellect, which often considers exoselves. Licklider's influential 1960 vision of human-computer symbiosis where both would interactively complement each other's strengths begins by discussing 'mechanically extended man':

> Man-computer symbiosis is a subclass of man-machine systems. There are many man-machine systems. At present, however, there are no man-computer symbioses. The purposes of this paper are to present the concept and, hopefully, to foster the development of man-computer symbiosis by analysing some problems of interaction between men and computing machines, calling attention to applicable principles of man-machine engineering, and pointing out a few questions to which research answers are needed. *The hope is that, in not too many years, human brains and computing machines will be coupled together very tightly, and that the resulting partnership will think as no human brain has ever thought and process data in a way not approached by the information-handling machines we know today.*[34]

Engelbart's 1962 paper on augmenting human intellect builds on Licklider but also Vannevar Bush's (1945) memex concept that would provide an 'enlarged intimate supplement to one's memory'.[35] Engelbart even considers user-generated 'kernels' of data that can be added to the system and recalled later, very similar to the Remembrance Agent. He also makes it explicit that one of the first targets of augmentation would be the people developing augmentation in order to speed up research progress (foreshadowing I.J. Good's 1965 concept of an AI self-improvement intelligence explosion – a concept later called 'the technological singularity' by Vernor Vinge).[36] These early visions prefigured and contributed to the

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[34] (Licklider 1960) (Italics mine)

[35] Engelbart 1962; Vannevar Bush 1945

[36] Engelbart 1962; I.J. Good 1965; Vernor Vinge

development of hypertext and personal computers even though the actual technology was not expressed as exoselves.

Wearable computers did not revolutionize personal computing in the 1990s -- the systems were too cumbersome, required expertise to use, and the displays needed did not become commercially available. The attempted consumer revival in the form of Google Glass in 2013 also failed, despite successful wearable computing niche uses. Ironically it may have been the spread and technological sophistication of smartphones that made the system superfluous. In turn, the improvement in wearable technology has enabled the quantified self movement.[37]

The monitored self as the virtuous self

Figure 2: Advertisement for Microsoft Band[38].

[37] (Swan 2013).

[38] *https://www.windowscentral.com/microsoft-band-read-backstory-evolution-and-development-microsofts-new-smart-device*

A key difference from many tools is that exoselves are intended to form cybernetic feedback loops with their owner that persist and develop with the owner.

The simplest way of building a feedback loop is to make normally less accessible information about the owner available on a conscious level. A weight scale, a pedometer, or a neurofeedback device takes normally invisible information and converts it into a numerical weight, progress towards an exercise goal, or a visualization of the brainwave state that can then elicit actions (dieting, exercise, mental training). Often mere availability is enough: gaining a pedometer increased people's physical activity by 26.9% over their baseline,[39] and fitness trackers often change both walking, exercise and food intake.[40] One can also design the interface to reward or punish outcomes in the hope that this will stimulate proper action. The rewards can be entirely symbolic like scores and badges in gamified systems, or social feedback through networked devices. The aim is to make the *joint* system of owner and device converge towards the right behaviour. The weight scale is at a disadvantage here compared to the wearable device since it is not present in the owner's world at all time. Continuous feedback has a higher chance at affecting behavior than occasional inputs, at least if it deals with behavior that can also be adjusted directly.

Swan describes the quantified self as a 'a proactive stance toward obtaining information and acting on it'.[41] The aim is accurate self-knowledge, and through this, as the slogan for Microsoft Band proclaimed, 'This device can know me better than I know myself, and can help me be a better human'. One can view this kind of system as a way for having higher order desires attempt mastery over lower order desires by strengthening their feedback through an external mean. A Freudian might view it as an exo-superego acting as a proxy for the superego, while an Aristotelian might view it as a tool for achieving virtue by gaining the information relevant to acting right.[42]

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[39] (Bravata et al. 2007

[40] (Duus & Cooray 2015

[41] (Swan 2013).

[42] The saying: 'We are what we repeatedly do. Excellence, then, is not an act, but a habit' is popular among fans of the quantified life and well expresses the idea of

But this improvement often involves both a carrot and stick. Users report not just rewarding feelings when reaching their goals but also frustration when failing, feeling pressured or controlled by the devices, yet feeling naked without them.[43] There may be a degree of dependency built up where self-monitoring without the system can become more limited, and where agency is located in the extended system can be contentious.[44]

The challenge here is (1) what is being measured may not be the true goal (brainwaves do not correspond 1-to-1 to mental states, so optimizing them by neurofeedback may not achieve a desired state), (2) even good measures can become useless as behavior adapts to them (Goodhart's law: 'when a measure becomes a target, it ceases to be a good measure'), (3) the feedback may not drive towards the desired goal, and (4) the device may not only provide self-knowledge to the user but also information to other parties[45] -- or make those parties able to influence the feedback mechanism. A final and perhaps the most important question is (5) what 'better' means. What kind of daily functioning, diet, or performance is truly better? The system itself does not provide an answer beyond its affordances, in turn usually set by commercial considerations.

It is vital to recognize the limitedness of simple informational feedback. Most important aspects of life are not distillable into single parameters, proper feedback is often multidimensional, and more informative sources of information allow us to understand, make predictions and generalize in open-ended ways. The feedback exoself parts are hence just the simplest rung of a ladder of more complex conceivable exoself parts. 'Care of the self' requires introspection and exploration of the self-knowledge in an open-ended way that self-tracking may partially enable but feedback control does not.

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setting up virtuous habit-forming feedback loops. It is commonly misattributed to Aristotle, but actually due to Will Durant (1926).

[43] (Duus & Cooray 2015

[44] (Duus, Cooray & Page 2018)

[45] (Crawford, Lingel & Karppi 2015)

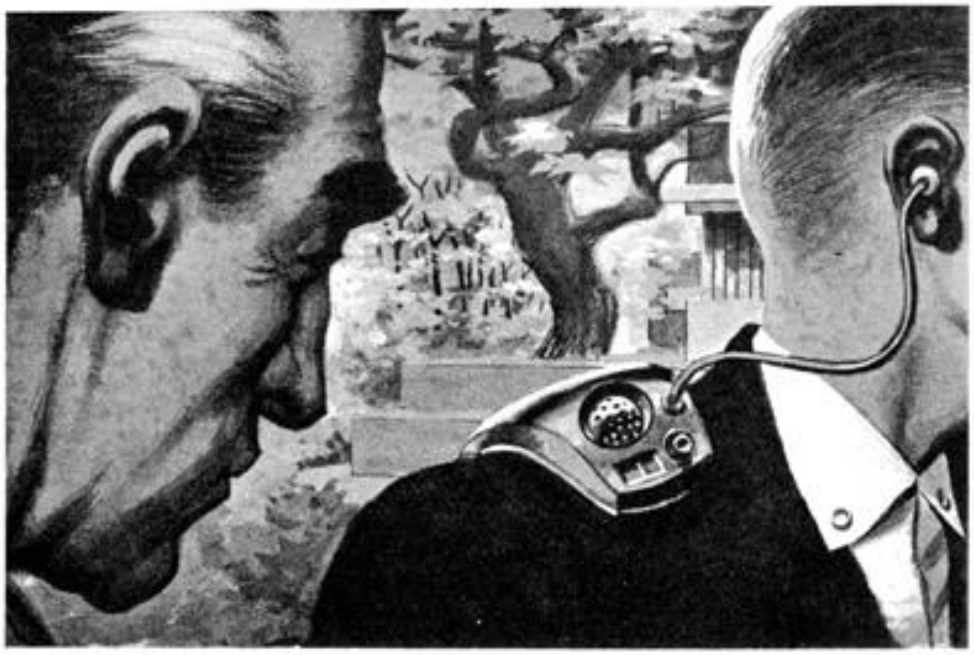

Figure 3: Illustration from Fritz Leiber's "The creature from Cleveland Depths" Galaxy, December 1962 (illustration by Wood) https://www.gutenberg.org/files/23164/23164-h/23164-h.htm *"a tickler reminds you of your duties and opportunities—your chances for happiness and success!" In the story, a portable reminder device named the "tickler" is invented and rapidly improved to motivate users towards their duties and opportunities. The feedback loop between humans, ticklers and society gets out of hand…*

We can contrast this monitored and regulated self with wearable computing pioneer Steve Mann's vision of 'humanistic intelligence', where 'The technology is responsive to the users - we shape the computer's behaviour, as opposed to the computer causing us to shape our activities to correspond to its pre-programmed assumptions.'[46]

The main target of his critique is systems that replace human functions and in the process prevent these functions, and the goal is to enhance human intelligence very much along the lines of Licklider's vision (and heeding Norbert Wiener's early warnings of the misuse of cybernetics):

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[46] (Mann & Niedzviecki 2001, p. 30

> This is accomplished, metaphorically and actually, through a prosthetic transformation of the body into a sovereign space, in effect allowing each and every one of us to control the environment that surrounds us. . . . One of the founding principles of developing technology under the HI system is that the user must be an integral part of the discourse loop. The wearable computer allows for new ways to be, not just do.[47]

Note that being part of a cybernetic feedback loop is still part of the vision, but instead of the human being the part that is corrected or replaced it is now part of the joint intelligence of the system: the HI scheme in a sense requires a proper exoself.

Mann suggests that three attributes are important for maintaining this: constancy (the system is always ready to interact with the user, and the signal flow between them runs continuously), augmentation (the user will be doing other things than mere computing, the system will be augmenting both intellect and senses), and mediation (the system encapsulates the user, allowing both filtering out unwanted information and privacy by controlling what information leaves). Constant monitoring is still essential but now hopefully in service of the user.

The problem is that HI for the individual may still not function equitably on the social level. Mann has championed sousveillance as a way for humans to counter or equalize institutional surveillance power. But he has had run-ins with people objecting to how he was documenting his interactions with them. Since he had greater documentary power than them, his view on the situation was amplified afterward.[48] Even if the cybernetic control within an extended person is humanistic and ethical, that person is still inside a social and cultural cybernetic system that needs to be humanized.

(Exo)selves as projects

Exoselves are rarely described as static objects or states, but rather as ongoing projects of exploration or realization. Since integration with the self takes time, it is natural to treat them as future-oriented projects. To

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[47] (Mann & Niedzviecki 2001, p. 30-31)

[48] https://eyetap.blogspot.com/2012/07/physical-assault-by-mcdonalds-for.html

Steve Mann wearable computers have been an ongoing theme mixing with life since adolescence;[49] to Michael Chorost gaining a cochlear implant led to a process of phenomenological exploration of the sensory world and what it means to be a human.[50]

We may distinguish between three common stories about exoselves:

- The optimized quantized future personal self
- The promissory transhuman self
- The shared global noosphere-self

The future personal self is the most common vision: systems that help us quantify, control and extend our abilities in such a way that we approach some imagined ideal persona. The exoself parts are keys to unlock this future desire. As Swan describes the short-term future of the quantified self: 'The QS experimenter is simultaneously participant, practitioner, and beneficiary of studies. The cycle of experimentation, interpretation, and improvement transforms the quantified self into an improved ''higher quality'' self.'[51]

This is the short term future. Longer term she foresees the qualitative self, measuring qualitative aspects of life and helping improve life quality. Beyond this, the quantified/qualified self evolves into a true exoself: '…the current moment of self-quantification is merely an intermediary step toward something else -- the future self. This future self is one that is spatially expanded, with a broad suite of exosenses -- the exoself. . . . QS activities are a new means of enabling the constant creation of the self'.[52] This self shades over into the transhuman self, aiming much further, 'Data quantification and selftracking enable capabilities that are not possible with ordinary senses'.[53]

Natasha Vita-More expressed the transhuman vision through her artwork 'Primo Posthuman', which features design visions of a future modular, upgradeable and changing body.[54] She argued that an exoself (in her

[49] Mann & Niedzviecki 2001
[50] (Chorost 2005
[51] Swan, 2013.
[52] Swan, 2013.
[53] Swan, 2013.
[54] www.kurzweilai.net/radical-body-design-primo-posthuman, 1996.

terminology a 'metabrain'), composed of AI systems intimately linked to the human part, would be a way of acquiring wisdom by augmenting the sensory and sense-making abilities.[55] But more importantly, 'By its very nature, the ideal of Primo Posthuman relies on a new human nature, one that continues to change over time and is driven by social changes that are progressive, yet critical, in relying on a reasonable approach to applied technological modifications.'[56] This is very similar to the vision of 'exocortical cognition' in Dambrot, explicitly hoping to augment human ability in order to minimize the human-AI gap (a concern that shows up already in Licklider 1960 and is common among transhumanists).[57]

Max More, one of the founders of modern transhumanism describes self-transformation as a transhuman virtue that involves selecting the right tools -- psychological, social, technological, biological -- to redefine and recreate the self.[58] One of the key issues if how to maintain a personal development path, and More suggests using an 'Optimal Persona: A personally constructed and sustained model of the person into whom you intend to develop' as a goal:

Comparing our present condition to our paradigm will allow us to steer a course through distractions and temptations more effectively than trying to reason our way along solely by using abstract rules, principles, and guidelines. Cybernetic control systems work on this principle. They have some map or representation of their destination, and continually compare their present state or location to the map, then make adjustments to keep on track. Our paradigm – which I will call the ideal self, or the Optimal Persona – differs from the map of many cybernetic systems in that it is dynamic, not static.

The cybernetic control here requires various forms of self-monitoring to see where the self can be updated in a more excellent direction but the essay also explicitly points out integrating with technology -- not in order to become mechanized or constrained, but the opposite: '…some technologies are diverging from traditional rigid machine behavior, and evolving

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[55] (Vita-More 2006

[56] www.natasha.cc/paper.htm

[57] Dambrot, 2016

[58] (More 1993)

towards an organic, flexible, complex function suitable for supplementing our limited brains'.[59]

These visions come from within the transhumanist movement aspiring towards an improved human nature. But actual neuroscience is bridging the gap between hoped-for cyborgization and technical possibility. An interesting example is the work by Miguel Nicolelis et al. on brain-controlled prosthetics. These systems create a full cybernetic feedback loop: the animal attempts to learn how to make the robot arm move in an appropriate fashion by observing its movements, which are based on the machine interpretation of the animal's neural signals. Learning is occurring not only in the animal brain but also in the system interpreting its signals: over time a joint neural code emerges that is equally due to the biological and artificial parts of the system.[60] It does not make sense to view them as separate.

In an even more impressive experiment a brain-to-brain interface appeared to allow pairs of rats to exchange information to perform a task better[61] and groups of monkeys to jointly move an arm;[62] here several animals are acting as each other's exoself.

The final vision of a self is the shared noösphere self. The noösphere concept of Vernadsky and Teilhard de Chardin is the sphere of thought/consciousness added to the geosphere and biosphere by human civilization and technology. As human society evolves, the noösphere develops towards ever-greater personalization, individuation and unification of its elements. While de Chardin saw its full development as leading to an eschatological unification with Christ, other thinkers imagined social phase transformations,[63] the emergence of a superorganism,[64] or a global brain[65] due to then-future technologies interconnecting the minds of humanity.

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[59] More, 1993
[60] (Carmena et al. 2003
[61] (Pais-Vieira et al. 2013)
[62] (Ramakrishnan et al. 2015)
[63] (Stapledon 1931
[64] (Stock 1994
[65] (Heylighen 2012

Here the exoself becomes shared: while the self remains it also overlaps with all other selves, forming a joint exoself that through emergent feedback aligns the group. While this easily lends itself to eschatological visions, we should recognize that it is already happening in the everyday sense of being market participants: our economic selves are through market mechanisms creating joint conditions that affect us (not always to our individual benefit). On the more modest side, Starner and Rhodes hoped shared remembrance agents would create better distributed cognition. Taken to a fictional extreme in Charles Stross science fiction novel *Accelerando* (2005) this leads to a thief stealing a man's exoself acquiring part of his identity and goals, while the man loses his.

Wikimedia's current vision statement is 'Imagine a world in which every single human being can freely share in the sum of all knowledge. That's our commitment'.[66] Knowledge is usually regarded as something held in a mind ('justified true *belief*' to the Platonist epistemologist): to freely share in the sum of all knowledge requires a shared mind. The shared Wikipedia-self I became aware of in Beijing is a step towards this vision.

[66] https://wikimediafoundation.org/wiki/Vision

Figure 4: Jingjing and Chacha, the cartoon mascots of the Internet Surveillance Division of the Public Security Bureau in Shenzhen, People's Republic of China. "As a Shenzhen official candidly told The Beijing Youth Daily, "The main function of Jingjing and Chacha is to intimidate." The article went on to explain that the characters are there "to publicly remind all Netizens to be conscious of safe and healthy use of the Internet, self-regulate their online behavior and maintain harmonious Internet order together." (Thompson, Clive. (2006) Google's China Problem (and China's Google Problem). The New York Times Magazine, April 23 2006.)

A shared self raises deep questions of who has power. My Wikipedia experience shows how an exoself part can be conditional on the control of others -- they can be censored, manipulated, promoted, subpoenaed, deleted or commercialized. Besides the usual suspects holding power over parts of our extended online selves -- corporations, governments, cultural and technological assumptions[67] -- there are complex negotiations between participants that can be just as domineering but even less transparent since there is no clear center of power, no appeal against the emergent norms or market conditions. Chilling effects, self-regulation, and incentives make the person complicit. Being subsumed in a superorganism makes one expendable, yet setting up the right forms of transparency and openness in a shared self multiplies existing challenges in political and social science with the cybernetic challenges of self-monitoring.

The future, seen through the exoself

The vision of exoselves has an air of futurity. They are an image of the future, extended human. While radically enhanced posthumans are too abstract to visualize easily and may be hard to relate to, exoselves provide a ready-made image of a transhuman that is concrete and visual. We can even try it in small doses.

Concerns about selfhood affects the willingness to enhance our traits: we are unlikely to want to enhance ourselves so that we become somebody different. At least in the case of drugs people appear reluctant to enhance traits fundamental to self-identity compared to less central traits; framing the enhancement as enabling rather than enhancing the fundamental self

[67] For example, consider the list 'Falsehoods programmers believe about names' and how it constrains identities: www.kalzumeus.com/2010/06/17/falsehoods-programmers-believe-about-names/

removed this disparity.[68] But exoselves promise to amplify or improve our *current* self rather than change who we truly are, and are hence more appealing.

Since it is usually far easier to make and use extensions than direct human enhancements and cyborgs it is possible to make demonstrations, immanentising the future. Ron Hale-Evan's exoself is a 'child's crayon drawing of an exoself'.[69] Steven Mann lives the cyborg lifestyle to explore its meaning. Stelarc's bodily extensions serve as artistic statements questioning claims about the body and self having an absolute nature as well as foreshadowing future thought: 'It's only through radically redesigning the body that we will end up having significantly different thoughts and philosophies'.[70] Kevin Warwick's (2003) neural implant was explicitly intended to not just gain knowledge but to change the ethical debate by immanentizing the cyborg:

Experiments, such as those just described, do not take place in a vacuum. The experiments themselves affect and in turn are affected by society. In a straightforward way they might open up a completely new branch of science or study. Of equal importance however is the fact that they change the mindset of a group of people. Suddenly it is realised that something is technically possible, implants are not science fiction but are science fact.

This chapter argues that exoselves are a common way of depicting and manifesting futurity. They gain their power because like many tools they make use of the fuzziness of our normal self to extend it, but further they provide feedback that intentionally shapes us, and entice us to build 'exoself capital' by investing effort into the project since they give us advantages and a symbolic link to a promised better future self.

The positive visions of improved health, agency, and intellect often collide with unwanted side-effects, complex social and economic realities, not to mention the practical technical limitations. To some thinkers exoselves are negative possibilities, representing either the external control over self or agency, or a dissolution of the self either into something else (or into nothing). Since exoselves are framed in futurity, the actual benefits and

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[68] (Riis et al. 2008

[69] Ron Hale-Evan's (2006)

[70] (Atzori & Woolford 1995)

drawbacks are usually less important than the imagined utopian and dystopian visions – the same extension can be used as a case by both sides.

The exoself is by its nature an egocentric project, extending the 'I' to encompass more. But by extending it also makes the arbitrariness and fuzziness of the self vivid. The structure of the self becomes a matter of design. The self is made of parts but their ownership can be complex and overlapping. The extended self enables certain forms of power and experience at the expense of other forms. None of these observations make the effort self-defeating: one could just as well criticize children for attempting to extend and define their own selves on the same grounds. Rather, the recognized paradoxical and critically re-negotiated self may be the healthiest self.[71]

We must create our *own* (exo)selves. But who *we* are is the matter of design.

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