Humanity in the Bathwater:
Restoration vs. Augmentation in Bionic Design

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As an eight-year-old, I was misled to believe that cybernetic interventions result in better human beings. During the opening sequence of the extremely popular 1970's American television series *The Six Million Dollar Man*, a soothing, authoritative voiceover speaks. . . "Steve Austin: Astronaut. A man barely alive." [1] Then a different, darker voice replaces the first, "Gentleman, we can rebuild him. We have the technology. We have the capability to make the world's first bionic man. Steve Austin will *be* that man--better than he was before--better, stronger, faster."[2] The last line evoked a pseudo-religious notion that Austin was The Chosen One. These same words, albeit with "higher" substituting for "better," comprise the motto of the International Olympic Games: "Citius, Altius, Fortius," or "Faster, Higher, Stronger." They are attributed to a Dominican Priest of the Catholic Church in the late 1800s. It is interesting to note other subtle messages embedded in the dialog above.

Steve Austin is primarily identified first as an astronaut. Astronauts are extraordinary persons who are granted audience with that which is literally beyond this world. Secondarily, Austin is identified as a man, a human being. Already, an hierarchy has been established with alive man placed beneath astro-man. This particular man is one who is "barely alive." Spoken atop visuals of a complex and buzzing operating room, the phrase "barely alive" takes on a morbid tone. In vernacular, this is a man fighting for his life. However, this same phrase freed from idiomatic terms reveals something quite different. A member in the elite astro-fraternity already associated with going beyond this world, this man that is "barely alive" is potentially transcendent,

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[1] Performed by Leonard Nimoy

[2] Johnson - taken from original program audio

perhaps in the process of transcending. Much of the substance that once comprised the totality of this human's anatomy is undergoing replacement by some greater substance. The language and imagery used in the introduction of this television program is dramatic, but it is the subtle implication that is astounding: Steve Austin is transubstantiating before our eyes. A more hermetic interpretation of the *Six Million Dollar Man* intro is through technology, the modern alchemy, he is transformed into a being greater than human. He transubstantiated from a leaden man into a golden super-human via the great enabling force of technology. Steve Austin represents a late twentieth century man-god.

Fast-forward thirty-six years when BCI's (brain controlled interfaces), bions (miniature electromagnetic amplifier/transceivers), subminiature microprocessors, and pattern-recognition software (Artificial Intelligence) work together to enable a limbless individual to function at 90% or more of an intact person.[3] Bionic limbs and sensing organs have returned mobility and independence to legions of previously defunct human bodies. Through electronics, the mechanical functionally integrates with the biological via transceivers jammed, then doped, onto nerve endings. The contemporary bionic arm is affixed to its host via titanium hardware mounted directly into bone, a design inspired by the bio-mechanism of antlers.[4] The contemporary bionic hand mimics all twenty-two degrees of motion found in the natural human hand.

These devices are so naturally inspired that the design even reflects the usual limitations of the human appendages in form, ability, motion, and strength. In spite of

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[3] Advanced Materials & Processes, p.49

[4] Woodard, (no page reference given for this article sourced online)

advances in biomechanics that in many cases far exceed the capacities of their human prototypes, these devices are, by design, functionally attenuated in a deliberate attempt to retain their handedness and, by extension, their humanness. It seems deeply ironic that the zenith of engineering and technology is employed, not to realize the greatest possible design, but the most banal.

It is fascinating that a person with a machine-hand would favor struggling awkwardly with the task of gripping and wielding an electric drill intended for a natural hand over equipping the potentially superior modular prosthetic with a motorized drill accessory. In other words, given the choice, many recipients of this technology tend to prefer restoration of their wholeness, to reform themselves into that which makes them appear human, rather than embrace the potential to be super-human. Of course, implicit in the term super-human is the inhuman, and perhaps too frightening a concept to live with.

In a further bid to recapture the essential and dynamic human form, designers are injecting the motion-control sequences of these devices with algorithms meant to express the gesture of a movement beyond energy efficient, precisely calculated motions. It turns out that the twitches and wayward automatic movements of our natural limbs are a thing of beauty and, in cutting edge prosthetic designs, an attribute to be injected into the artificial limbs. This mimesis attempts to make the artificial more human-like. The intent here is that the casual, or even the engaged, viewer will be deceived into believing the prosthetic limb as something it is not; that is, a real human limb. Brilliantly argued in his essay "*About the Word Design,"* Vilém Flusser's sagacious

notion of “de-sign” is perfectly illustrated here. Good design of the prosthetic device dupes the audience into thinking the artificial limb is not an artificial one.

Some who herald the dawn of a new era in humanity through design suggest that the technology to represent the human body is challenging the ability to distinguish between the natural and artificial. Scotland-based Touch Bionics claims their “i-LIMB Hand,” a prosthetic representing the state-of-the-art in bionic appendages due to its “full articulation,”[5] is “too realistic.”[6] A number of the device’s users “were treating it as though it was flesh and blood rather than machinery, and that sometimes took it beyond its capabilities.”[7] This illuminates another interesting dichotomy: On the one hand, the devices can be so naturalistic that they suggest a robustness and reliability found only in a natural appendage, while on the other hand, their exists the perception that cybernetics offer superiority of the synthetic over the natural. Having seen video of the device, I feel Touch Bionics is guilty of over-esteeming their work. The device may have launched some of its former limb-less users into fits of overzealous activity, but its design would not fool the casual observer into believing the hand is a natural one. This is a dangerous place to be from a market perspective as the i-LIMB may be close to dropping into the Uncanny valley where people exhibit an intense revulsion toward representations of humans that are near, but not, perfect in every nuance.

Dean Kamen, a leading U.S. technologist and chief contributor to the DARPA prosthetic research described below, cautions, ”I don’t think you’ll see people lining-up

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[5] Nathan, p.30

[6] ibid

[7] ibid

anytime soon to replace real hands with prosthetic ones."[8] Inherent in this statement is the corollary that eventually, people *will* be standing in line to upgrade their naturalness. I find his words here tinged with a false modesty when compared with another statement he claims to have made to a limbless Gulf War veteran, "I'm not going to stop [designing prosthetics] until your [fully limbed] buddies are jealous of your [prosthetic] 'Luke Arm'."

Kamen's future seems just out of reach, but barely so and seems to fulfill the central criticism expressed by opponents of eugenics; which is to say the designed and technologically mediated human will render the natural human inferior and powerless. In his essay "*Incisive Will and Solid Matter: The Aggressive Nature of Tools,*" Bachelard provocatively opines, "The hand equipped with a good tool renders the hand equipped with a poor one ridiculous."[9] Perhaps, these words explain the desire to limit the capability of the bionic arm. It could be shameful to have the unnatural prosthetic make the natural appendage appear comparatively disabled.[10] This concept extended outward foreshadows the day when one body equipped with a good cybernetic intervention renders another non-intervened body ridiculous.

Not everyone is made uncomfortable with the transformation of the human body into something proto-mechanical. Worldwide, there are at least three million people with artificial implants.[11] Though most are intended to restore the body's form and or

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[8] Kamen

[9] Bachelard, p.28

[10] After all, isn't the aim of restoration to restore, not further degrade, the user's self-image as a whole and complete human?

[11] McGuire, p.7

function, many are intended to aesthetically, or, to functionally augment and enhance. One notable pioneer is Australian-based performance artist STELARC, who promotes the idea of the human body as obsolete. Using his own body as a platform for site-specific interventions, he boldly pushes the envelope of cybernetic evolution to a disturbing level.

Less radical, but still more interesting is the community that does not simply promote, but actively engages in pushing the social, aesthetic and functional boundaries of prosthetics. Becky Pilditch, a Master's candidate at the Royal College of Art in London, is responsible for the *Super Prosthetics Project*, the purpose of which is, "to conduct a series of creative experiments to challenge current ideas of prosthetics and explore what a wearer might choose to create in that space if he/she could have any functionality or aesthetic."[12] Likewise, Wolf Schweitzer, an advocate for his community of amputees in Switzerland and around the world via the web has a remarkable document of intelligent, creative, and openminded perspectives on the state of the art. Mr. Schweitzer is a relative newcomer in the community having lost his arm to disease below the elbow only three years ago and at the age of 39. Yet, his social, functional and aesthetic experiments with his own prosthetics and modified versions of other designs are astonishing.

Pilditch and Schweitzer, both articulate, European, Gen-X, creative professionals are representative of a certain socio-political demograph one can likely connect with Liberal social views. Is there a socio-political pattern that segregates those who

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[12] Pilditch

promote augmentation? Conversely, is there a relationship between socially conservative types and a desire to embrace this technology for its restorative promise? One significant and representational population of primarily conservative values is the men and women of the Armed Services. By most accounts, damaged veterans are mainly interested in one thing: a restored a sense of what feels normal and less concerned with pushing the capabilities or appearance of these devices into something of science fiction. But are they really getting what they're asking for?

From a casualty perspective, combat veterans returning from the escalating Gulf wars differ significantly from veterans of other conflicts. Recent advances in body-protecting personnel armor coupled with life-saving field medicine techniques and a well coordinated logistical network, have created an expanding count of veteran's returning home without limbs. Improvised Explosive Devices (IEDs) common to the contemporary combat environment have resulted in an alarming and accelerating population of U.S. soldiers missing hands, arms, and legs. In some cases, all of the above, and toss-in half-a-face. In a bid to restore serviceability to its servicemen and women, the Defense Department's research wing, DARPA, has contracted with some leading non-government research facilities to accelerate the advancement of bionic technology. On the surface, this appears like a generous and honorable effort. But like many, if not most, government research projects, there is a darker motivation for this seemingly heart-felt research.

Besides the restorative value of bionic technology, DARPA is also directing parallel research into the augmentation of human capacity. Through projects such as Ratheon's "Sarcos Exo-skeleton" and the University of Tsukuba's "HAL (Hybrid Assistive

Limb),"[13] people are endowed with super-human capabilities such as nearly limitless endurance, four-fold increases of strength, and bullet-proof armor. While this technology is lauded for effectively returning function to immobile veterans, advanced applications of this same existing technology allow for more imperial uses such as direct neural integration of soldiers with their weapons, and even autonomous humanoid combat robots.

DARPA is developing non-human combat robots that learn literally through osmosis. In this scenario, a soldier climbs inside the robot which is a sophisticated exo-skeleton. Once secured inside, the soldier then performs combat maneuvers while the robot learns the moves. Once the robot training is complete, the human egresses the robotic shell which then executes missions autonomously. In a techno-avalanche of this proportion, one recalls Vilém Flusser's notion of the "too-goodness" of the design that allows for such a protracted functionality. In a related essay "The Ethics of Industrial Design," Flusser calls into question the "moral and political responsibility of the designer,"[14] in an age in which new technologies are stitched together from multiple disparate sources, thereby extending inculpability to all who unwittingly design our demise. To this I add that responsibility also falls on the citizenry, as participants and sculptors of culture, to engage our consciousness, to examine deeply and broadly the question of where our species is headed now that we are at the drawing board.

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[13] Did this team miss A.C. Clarke's sardonic representation of artificial intelligence?

[14] Flusser, p.66

The fact that a mainstream television show about a cyborg buttressed its enthusiasm with the words of a Catholic priest not only to make palpable but to glamorize unprecedented evolutionary territory is itself remarkable. Millions of impressionable youths watched every episode, ninety-nine in all from 1974 through 1978. I argue that such repetitious exposure to this fanciful technology had a powerful effect on the cultural psyche. In fact, less than a decade after the last episode aired, as a teenager I endeavored a career in bio-mechanical engineering with the express intent of designing the world's first humanoid robot.

In 1974, the technology to make Steve Austin a better, stronger, faster man was out of reach. Today, however, several agencies are working feverishly to elevate this once prodigious technology from the prosthetic to the robotic level. We actually do have the technology to make Steve Austin better, but in whose eyes? The real question is: will he retain his membership in the *homo sapien sapien* club? Perhaps, we are on the dawn of evolving into *homo sapiens transcendens.* With the rapidly approaching epoch of the so-called Gen-rich class of our species, the question of what it means to be human is of greater and greater consequence.[15] It is imperative that an entire cross-section of society, with emphasis on designers, be employed to give meaningful response to this question with haste.

Yet again, society finds itself in a dialectical bind: To not pursue this research is to foil the human drive to augment, adorn, or otherwise modify with intent to improve on nature's multifarious products, including man himself, thereby fulfilling the sentient

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[15] Or stated more provocatively, what will it NOT mean to be human in terms of social opportunity?

creative drive. But to chase this potential chimera with reckless momentum is to drive humanity from its humanness, or stated alternatively: from its soul. Bitting critically into society's slothful pace toward deep ethical inquiry and guidance regarding this and other profoundly technological, profit-driven pursuits, Jeremy Rifkin warns of, "new and serious forms of segregation." This division will result from a society split between what Princeton University's Lee Silver refers to as the "naturals" (limited), versus the "Gen-rich,"or, technologically mediated super-natural (unlimited), humans. The predominant wisdom sights a division so profound as to create an entirely new species of human ascending into an über-class over a slave class practically overnight, by evolutionary terms.

What does it mean to be human in an age when the materially and genetically modified person is capable of super-human performance? What is the real intent behind the development of this technology? What inherent cultural wreckage are we overlooking through our passive interest of this modern spectacle? What of our humanity will be gained and lost if we don't open our eyes and intellects quickly? What social implications of equality and inequality arise with a technological "race to keep pace with the Jones'?" How will the adopters of this technology, the so-called Gen-rich, affect the value of their natural human counterparts? As Kurzweil points out, "Most advanced mammals have added one cubic inch of brain matter every hundred thousand years, whereas we are doubling our computational capacity of computers every single year."[16] If left unchecked, this progress coupled with advances in bio-integration will clearly usher in a radical inequality between enhanced and conventional humans. The

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[16] Kurzweil, p.16

stakes are too high for designers and other critical practitioners to sit on the sidelines and watch, through bionic eye implants like those heralded back in 1974 by *The Six Million Dollar Man*.

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