

Prospective Templates for Post-Homo Sapiens Public Policies

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Image precedes actuation, particularly in public policy formation. Source icons, or templates, from which popular attitudes towards issues arise include the arts (especially literature and cinema) and, to a lesser extent, legal precedent.

This piece extends the thesis of image to policy to the post-Homo sapiens prospect. Six pathways to this prospect (robotics/prosthetics, drugs/pharmaceuticals, genetic engineering, space colonization, virtual reality and nanotechnology) are discussed as to how each might be influenced by these templates.

Keywords: Post-Homo sapiens, technology and evolution, public policy and evolution

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Journal of Futures Studies, November 2001, 6(2):43~64 43

Introduction

The baseline proposition for this work is that public policy formation is grounded in a normative social environment primarily influenced by popular culture, and increasingly characterized by mass-media driven iconic codes (Antohin, 2000). These codes express a collective mythos or paradigm through which public policy templates and a preferred future is expressed.

A post-Homo sapiens species emerging from our technological manipulations is simultaneously familiar, fixed firmly within science fiction genre; and novel, as a subject for academic inquiry. Science fiction, once called the only moral literature left, along with the arts in general, serve as "an early warning system" (Thompson, 1986); tracking both the potentialities and consequences of various social policy options and trends (Thompson, 1986). Given the fact that technological innovations already in place are poised to supercede nature as the governing principle in evolution, this work is timely and even important, if only to help frame the coming post-Homo sapiens prospect.

"Homo sapiens", as used here, follows the definition derived from the biological sciences. Specifically, a post-Homo sapiens entity will not be the biological issue of Homo sapiens parents and be capable of producing viable offspring. However, post-Homo sapiens may, in some fashion, reproduce while still being dependent upon the intervention of humankind for perpetuation. This is not unprecedented given the case of corn's co-evolution with the Homo sapiens to cultivate it. There is no such thing as wild corn, yet corn is its own distinct species.¹ The survivability of domesticated livestock is compromised due to human selective breeding, yet they too are identified as their own species. There is also now the widespread use of genetically altered food and fiber crops with new varieties being developed at an accelerating rate, each unambiguously a species as universally defined.² Technically speaking, all of the developments cited above might be post-Homo sapiens species since they arose after the establishment of our own species. Thus, for the purposes of this work, the term will be refined to identify any species likely to supercede ours in governing evolution.

Interspecies relationships of dominance and dependency have come to develop both a formal-legalistic and normative status over time. For instance, the legal distinction between canines and felines based upon a dependency standard. Dogs are deemed property, subject to licensing, leash laws and general owner liability, owing to their dependence upon

humans to individually survive, while cats are legally defined as domesticated predators, not subject to licensing, or caretaker liability, because they are independently viable without the need for active human intervention.

The legal basis for commodifying all new forms of life was established by the U.S. Supreme Court in *Diamond v. Chakrabarty* (1980). It ruled that genetically engineered life forms were essentially inventions, and hence subject to U.S. patent law (*Diamond v. Chakrabarty*, 1980). This ruling aligned both de jure and de facto control over new species development to private and not public interests.³

The likelihood that post-Homo sapiens entities will be at least initially dependent upon Homo sapiens for viability renders this issue political to the core, creating a host of issue sets. These issues include laws governing the humane treatment of animals; and, as many argue, ultimately the rights, if any, of species other than our own. The specific characteristics of these policies are going to be determined by templates made up of the associations between the developmental pathways of post-Homo sapiens entities and their literary and legalistic precursors. We can now anticipate and review of the types of post-Homo sapiens likely to develop over the next generation, and forecast the nature of those policies likely to emerge as a result of their development.

The Six Paths: A Post-Homo Sapiens Typology

Arrayed below are six classes of post-Homo sapiens arranged by source technology and seminal literary influence. The categories are organized from most to least popularly familiar, yet, it will be argued within the paper, also range from least likely, to most probable.

Table A. A Typology of Post-Homo Sapiens by source Technology, and Seminal popular Literary References

Type I	Robotics/Prosthetics	<i>"Rossum's Universal Robots"</i>
Type II	Drugs/Pharmaceuticals	<i>"Ambrosia", "Soma", Dr. Jeckel and Mr. Hyde</i>
Type III	Genetic Engineering	<i>Brave New World</i>
Type VI	Space Colonization	<i>Journey to the Moon</i> <i>Martian Chronicles</i>
Type V	Virtual Reality	<i>Max Headroom</i>
Type VI	Nanotechnology	<i>Engines of Creation</i>

These six categories of post-Homo sapiens are, of course, pure types. Hybrid variations are likely to emerge in the long run as each type provides a synergistic augmentation to each other. Likewise, seminal literary references serve as points of departure for a discussion of policy templates. Such references do not necessarily predict specific policies, but their influence is clear in the deliberative process where they are frequently invoked in legislative debate as reflecting or influencing the public will. Much as we tend to prepare for the last war, literary references often function to instruct as cautionary tales; moving sentiment away from a path they project as leading to dystopia. There is something of a larger social principle at work out of a universal folklore to the effect that: "... when artificial creations come to life, they pose the greatest danger for those who made them." (Kovalev, 2001)

This paper concludes with a set of policy templates developed from each of these types ranging from the relatively integrative . (i.e., A.D.A.-like accommodations for visiting off-worlders), to relatively status-specific (i.e., performance restrictions on the prosthetically-enhanced, following similar provisions for boxers, martial arts professionals, and racing vehicle specifications).

Robotics/Prosthetics

The prospect of robots supplanting humanity is a common point of departure in any speculation of a post-Homo Sapiens social order. Literary and cinematic references abound presaging what would become a near universal public fixation on the possibility of a mechanical alternative to our species. The word, "robot", was coined in 1920 from the Czech "*robota*" (forced labor), first referenced in Karl Capek's play, *R.U.R.* (Rossum's Universal Robots). They have been the centerpieces of innumerable cautionary tales, signifying, better than any other technological icon, the climatic impact of the industrial revolution (Oxford English Dictionary, 1989). Robots are the earliest and best known of the projected post-Homo sapiens paths. Robots have symbolized the climax of industrial mechanization, often used metaphorically to critique the efficiency fetishism of Fredrick Taylor and his time-motion studies, and generalized to include virtually all references critical towards the rise of corporate state.

There is a dual dystopian vision in the literature detailing the rise of robots as leading inexorably to the subjugation of humanity by smart machines, rendering human workers into extensions of machinery they are compelled to tend. While the theoretical literature suggested as much from the Luddite writings to Karl Marx, this prospect was most dramatically foreshadowed in Fritz Lange's classic film, *Metropolis* (1928). Its opening scenes depict industrial workers in machine lockstep. Its subsequent plot line concerns an unfolding conspiracy between an archetypal mad scientist⁴, and plutocrat industrialist to control the masses by means of a robotic proxy.⁵

Variations on the robot as sinister agent became the stuff of all kinds of pop science fiction, such as exemplified in H.G. Wells' *War of the Worlds* (1898). *War of the Worlds*, in the finest tradition of science fiction, prophesized the coming horrors of mechanized warfare, and implicitly linked it with the relentless mechanization of the means of production worldwide. Machine-enhanced Martian invaders would later be adapted to represent the standardized minions of alien, totalitarian ideologies further confirming the robot as the impersonification of threat to individual human liberty.⁶

This view of robot as a threat to humanity was countered by the more sympathetic and optimistic writings of Isaac Asimov in his *I Robot* series of novels and short stories. Asimov offers an antidote to the tendency to see a threat in the rise of robots. Instead, he treats robots as intelligent machines that, for all their programmed emulation of human character, are still, in the final analysis, just machines. In a sense Asimov takes us on an upward-spiral back full-circle to robot-as-servant a la *R.U.R.*, but as forced labor forced by an internal "moral" programming rather than by slavish and morally neutral external direction.

Another non-android variation on the robot theme is manifested in the now ubiquitous personal computer. While facially violating Asimov's definition of robot as a machine that resembles a human being, any "smart" machine is effectively robotic (American Heritage Dictionary, 1985). The literal disembodiment of the robot was featured in Arthur C. Clark's 2001 *A Space Odyssey*, in which the HAL 9000 computer provided the services (and disservices) normally associated with androids. The lines between the android and the robotic machine continue to be blurred as software continues to be personified. Newer versions of *Microsoft Word* feature a pop-up animated computer monitor with Mickey Mouse-like legs and feet that prompts the user with what the programmers believe are helpful

hints. There are also programmed voices that prompt users at various decision points in the software use process.⁷

There is a further case against the robotic alternative that being any further development of the robots-as-a-species argument immediately runs into the problem of their not meeting the basic standards to qualify them as a form of life. Though often constructed to emulate the human form, they are clearly not living beings. A mechanical duck may look, walk and talk like a duck, but it surely isn't a duck. Robots are bound by the laws of entropy, not of evolution. Life, if nothing else, is a universally ordering force with robots only assisting in the project of ordering the universe. They are expressions of this essential sentiment, and are not the sentiment itself. There is little popular demand to become robots. The opposite is clearly the case. For one thing, they are too much associated with the second-most dominant genus on the planet, the insect, and as such take on a primal, Jungian level of threat to us as a species.

The trend towards the expanded use of prosthetics is another matter entirely. Prosthetic enhancements are such a common feature of our cultural landscape that we scarcely notice the extent to which they permeate our lives. The taboos against developing mechanical beings clearly do not apply to implanted or worn devices for health, protection or even cosmetic purposes. Such mundane equipment as footwear, gloves, sunglasses, sunscreen, corrective lenses, breast implants, pacemakers, clothing, artificial joints, and athletic protective gear from shoulder pads to shin guards are all prosthetic devices. They are so fully integrated into our normative landscape that one almost stands out for not having them.

The question then is not over the popular acceptance or rejection of prosthetic technology per se, but over the point at which identity shifts from that of the human "being", to human "host". Just as *Metropolis* presented numerous scenes of machinery determining the behavior of its creators, so to might prosthetics come to be the actualizing agent of the devices themselves, subordinating the unendowed human to that of a creature in its larval stage of development. This question implicitly raised in the popular science fiction in the image of the cyborg. In its generic form, the cyborg is so completely optimized in function, and so profoundly distinctive from the human form that it becomes literally alienated from their progenitors. The inferred difference that makes the difference occurs at the point the prosthetic crosses over from being a functionally inferior replacement for the original human equipment, to being an augmentation fundamentally superior to it. The common assumption is that a cyborg has human consciousness, but its identity is no longer, strictly speaking, human.

This prospect is very apparent in the sphere of the athlete. By definition, the athlete constitutes the cutting edge of physical capability across a large range of human endeavor. While the use and abuse of performance-enhancing drugs has been a prominent issue among sports policymakers, the refinement of orthoscopic surgical techniques and the transplantation of stronger connective tissue from one part of the body to another has gone virtually unnoticed. Again, there is relatively little public concern over enhancing physical capabilities when the augmentation is from the body itself, though the joint is often significantly stronger than before the procedure. This attitude apparently extends to simple mechanical enhancements such as artificial hip joints and knees, probably because these devices are seen to restore and not extend physical function. However, certain elements of the athletic community are very likely to succumb to the promise of greater capability and durability through reinforcing implants much as it has been the case with performance-enhancing substances.

The literary reference that provides the best insight into the alienating element of prosthetics comes from the basic characteristics of the *post-modern* comic superhero. The original *Superman* uncritically identified with his adopted species (apparently he was profoundly imprinted by his rural Midwestern upbringing). More contemporary species of super heroes often displayed a near despairing angst over the gap between themselves and the less capable community of beings in their midst. The *Spiderman* comic book series developed a character that was alienated to the point of being an outlaw. Finally, the *Mutants* comic and TV series portrayed the community of super heroes as an oppressed minority in which a sizable faction split away as militant separatists. By giving up on the ideal of harmonious co-existence with humans the *Mutants* series tread close to the logic of apartheid, though properly casting these advocates within both communities as at least wrong if not evil.

The policy templates for robotics versus prosthetics are thus different though complimentary. The robotic policy template is an extension of what exists for mechanized equipment in general, unless a breakthrough in artificial intelligence comes to invoke the Isaac Asimov template, "The Three Laws of Robotics" (The Oxford English Dictionary, 1989). The public policy impacts would fall largely on matters of liability for design flaws or misuse by the manufacturers or users respectively. The robotic devices themselves would not constitute a new legal class. Prosthetics are more likely candidates for regulation under the precedents in place by the various sports governing bodies ranging from the NCAA, to the IOC to

MLB, the NFL and NASCAR. These bodies are in place largely to balance the power of the technology to provide a competitive edge with the safety of the participants.

Drugs/Pharmaceuticals

Of the six types a post-Homo sapiens points of departure, none is so currently ambivalent in the public mind as a policy issue than that of drugs, either as medicines or as psychoactive agents. The ambivalence extends back even to the linguistic origins of technology. The Chinese root character for medicine and poison (yao) is identical.⁸ The muddiness between "good" medicine and "bad" drugs extends to the professional jargon where "narcotic" is defined medically as any pharmaceutical substance that creates a physical craving or dependence. Legally speaking, however, a narcotic is any substance that the law says is a narcotic.⁹

The use and abuse of pharmaceuticals, with their individual behavioral and social consequences is a current public policy concern, but their species-altering potential is also immanent. Concern is not just confined to the addictive, the performance enhancing, the mind expanding, or cosmetic aspects of their use, but in the potential transformation of physiological processes as well. Moreover, psychoactive substances, by definition, alter our consciousness. They influence our mind - that locus of human identity that makes us so utterly distinct from other life forms. Psychoactive substances can potentially turn people into animals or initiate us into entirely new realms of consciousness beyond that of common human experience.

There are three prototypical templates lodged in the popular imagination associated with drugs and pharmaceuticals. The first is literary template; a cautionary tale expressed in Robert Louis Stevenson's, *Dr. Jeckel and Mr. Hyde*, vividly describing the ruinous fate of the good doctor whose experiments with mysterious chemical compounds culminated in his being overcome by his base animal nature; the Victorian-era's worst nightmare. The second wave that seemed to both erode and reenforce the first, concerned the popular use of psychedelic agents peaking in the late 60s through the mid-70s, but still with us today in the form of the rave drug, MDMA or ecstasy. More recently there has been interest in more supposedly benign "smart drugs", often, but not always of an herbal variety. These include such over-the-counter substances as caffeine, Gingko biloba, L-Glutamine, Melatonin, Phosphatidylserine, Pireactam,

and Pregnenolone to name but a few (MedQuest Pharmacy homepage). However, none of these substances really point to a literal shift to a new species.

A now common alteration to human physiology is the immunization process. However, while the human immune system is altered through the introduction of weakened pathogens, is it somehow altered into a post-human state? The answer is yes and no, depending on the standard of appraisal and the possible accumulation of effects over time. The immunized Homo sapiens isn't in terms of a continued identification with the species, including its unimmunized members. To say otherwise would, for instance, classify the indigenous peoples of America as another species for being unimmunized to the diseases of the European colonists. In this the immunized share characteristics similar to those of the prosthetically enhanced. As with prosthetics, culture intercedes and overrides natural processes though there are also some religious communities (read cultures) that proscribe immunization as countermanding the will of God. There might also be long-term impacts that could alter the body's natural defense mechanism, but this seems unlikely since immunization merely accelerates the species own natural capacity to resist diseases. These immunological enhancements are destined to involve most of the species, and are the products of global public health policies, so in this sense the entire species is embarking on a collective alteration. When the entire species acts through its public policies to alter, there is no substantive divergence towards a new species.

What our review of prosthetics and pharmaceuticals completed, a condition emerges that somewhat mitigates against their being catalytic agents to a new species. This condition can be described in this somewhat wordy proposition:

"If the differences between users and non-users of prosthetic or pharmaceutical technologies are perceived to be narrow and the groups otherwise fall within the normative standards of human performance, behavior, appearance and consciousness; a common identity between the users and non-users will be maintained."

This principle is normative in tone, and history shows that even the most miniscule of variations between humans such as racial traits or religious practices can quickly be seized upon to justify the dehumanization of one group vis-a-vis another. Our "war on drugs", for instance, is a war on the unauthorized users of psychoactive substances. We pursue, with

vigorous zeal, the prosecution and incarceration of users, mostly because they use these substances for no good productive reason and can, sometimes, among some users, constitute a threat to themselves and others. The official public line is that the only good drug use is medicinal drug use. This is why the battle between advocates of the use of "medical marijuana" and the state has come down to the dispute over just how effective the use of pot is for various medically recognized physical ailments. Otherwise drug use is seen to threaten not only the norms of free will as with addictive substances, but behavioral, productivity, and physical appearance norms as well.

The widespread use of alcohol might seem to violate this premise of sanction against the recreational use of drugs, but its nominal exemption from being a more tightly controlled substance is testament to the industry's success at having its product perceived as a beverage and not a drug. Even with this powerful marketing effort, alcoholic beverage control policies are among the most elaborate in this country, and operate at all levels of government. While prohibition at the federal level failed, local options have included controls ranging from the sale of beer and wine only to outright bans on alcohol any sort.

Genetic Engineering

The seminal template for this post-Homo sapiens pathway is a federal Supreme Court decision, but its literary treatment has brought the issue to a now familiar pattern of popular fear and fascination over genetic engineering's ultimate impacts. In *Diamond v. Chakrabarty* (1980), the United States Supreme Court ruled in a five-to-four decision that a genetically engineered microbe could be patented (Land, 1996). In April 1988, the first animal patent was issued to Harvard University for the so-called, "oncomouse". This mouse was "created" to contain a gene useful in human cancer research. E.I. du Pont de Nemours & Company were granted an exclusive license to produce this living invention ("practice the patent" in legal nomenclature)(Land, 1996). Under the legal context that framed *Diamond v. Chakrabarty*, both the essentials of patent law (novelty, non-obviousness and utility), as well as the twin precedents of the Plant Patent Acts of 1930 and 1970 supported the contention that life can be invented. With this precedent set, a future set of relationships between Homo sapiens based upon the *Bladerunner* literary template seems well underway.

The species-altering potential of genetic engineering is almost certain to become a major public policy issue in the next 5 to 10 years. Jeremy Rifkin, in his book, *Biotech Century* cites ample evidence that this "future" issue is already here (Rifkin, 1998). *Diamond v. Chakrabarty* cleared the way for corporately directed development of new species, thus shaping the broad effects of this revolution are fait accompli. Hardly a day goes by now without a genetic invention being unveiled in the *Wall Street Journal*, or other in the business sections of almost any metropolitan newspaper. This in itself tends to confirm Rifkin's central thesis that this next technological revolution will be corporately led with the tacit approval of public agencies unwilling or unable to intervene on the basic ethical and social impacts of their work. While there are powerful self-policing constraints on biotech firms acutely aware that a single misstep on a product line will bring swift and possibly crushing regulation of their operations. However, recent revelations of unreported failures in gene therapy clinical trials point towards a move towards greater federal oversight. Congressional hearings on catastrophic breakdowns in FDA regulation of gene therapy trials were held in February of 2000.

The stakes for our species are enormous, not only on the prospect of truly breaking with our evolutionary heritage, but in the development of biological agents as weapons. Virtually all of the major technological innovations of this century were spun out of weapons development programs or received major impetus in their development for their weaponry potential. These include quantum leap technological developments in aircraft, rocketry, applied nuclear physics, optics (lasers, computer imaging, infrared imaging etc.), robotics, computers, satellite communications, internet, and pharmaceuticals. There are also the underrated engineering innovations that came out of our "National Defense" highway system. Even the development of the internet had impetus from federal interest in linking research centers to coordinate defense-related activities.¹⁰

Finally there's the cultural domination this country enjoys from mass media technologies. These technologies had a crucial role in winning the hearts and minds of certain populations that were in-play during the cold war.¹¹ While it is in this dark-side of genetics research that the species might be at most obvious risk, the more likely impact will be from the spin-offs derived from genetic research in non-defense applications; particularly in the medical fields.

Will the logical progression of genetic engineering result in the rise of a post-Homo sapiens species? It seems almost certain given the irre-

sistible prospect of a more robust offspring issuing forth in almost every sense of the term. Only normative sensibilities serve to moderate the trend. How will we be able to resist the prospect of more perfect offspring? With all due respect to scripture, it is not as if our design were optimal. Our upright stance, while freeing our arms and hands to manipulate, has placed stresses on our backs that have not yet been fully rectified through evolution. It is not just football players and veteran runners that will testify to the inadequacy of our knees to take the blows and shocks to which they are subjected. The light-skinned among us are far too susceptible to solar radiation. While visual acuity is no longer a prerequisite for survival, our eyes tend to fail well before the full term of our life spans. Genetic engineering promises to regenerate every part of the body, taking us to the brink of immortality. That we would exploit genetics to extend the quality and span of our lives is a virtual certainty. We might take comfort in these manipulations as resulting in no distinguishing marks, but the promise of genetics doesn't end there. Culture transcends nature as the determiner of even our appearance. The multi-billion dollar cosmetic surgery and health club industries are clear testaments to the power of conforming to prevailing standards of attractiveness and beauty. That these standards depart markedly from the aggregated averages of human appearance portends a shift towards those standards and away from the actual norms. We will shift towards artificially prevailing standards of beauty rather dramatically once the means of doing so can be made available on a mass level.

Still, we will not depart from our Homo-sapiens heritage very soon. Genetic engineering will not require suspension of our patterns of procreation, but will only intervene in the developmental process. This intervention does not a new species make any more than going under the knife for a new nose, a face lift, or tummy tuck does. The current thrust of the Human Genome Project is to make alterations in the sequences that lead to disease.

This may be the line that comes to be drawn for defining our species, but the prospects for species other than our own are likely to be in play. It is very unlikely that we will soon seek the development of new life forms with the qualities that make Homo sapiens unique, but a *Jurassic Park* scenario is not as farfetched. Nor is a species for weaponry project since it follows the logic of most cutting-edge technological development. It also becomes a difficult trend to follow given the secretiveness of such enterprises. The window for enacting proactive legislation proscribing the development of new species as weapons might have already passed, as

we know of active biological warfare programs ongoing in this country and in others.

In exploring the implications of genetic engineering geared towards weapons development, the cautionary literature of *Bladerunner*, *Species*, and *Terminator* might be applied as our policy template. Unfortunately, only *Bladerunner* posits an effective regulatory feature, but one which the story itself demolishes as an ethical option when applied to a species that emulates characteristics we see as our own.

There is then, no satisfactory template available governing the regulation of genetic engineering, unless one calls the same patent and copyright template used for the development of non-living technology itself satisfactory. We are left to the ethical guidelines of the industry itself and to some latent, but potent activists among us who are already mobilized over the genetic engineering of foods. This is hardly a comforting thought. We may anticipate an emerging and more high profile debate on this issue continuing over the next decade. At this point though, there is little to suggest a clear direction, let alone resolution as to where the biotech revolution might lead in terms of either loosing new species, or enhancing our own; or in what the difference between these two outcomes might be. At best the most certain statement that can be made is that both elements of the biotech revolution will indeed occur.

Space Colonization

We now pass beyond the most immediate of known innovations and proceed to the realm of more truly future developments. These projections are not entirely speculative, however. In the instance of space colonization, we have growing empirical knowledge on the profound effects of non-terrestrial environments on terrestrial beings. Most notably, we know that weightlessness begins to alter the body almost immediately. Bone calcium leeches away as if the body senses no need for a weight-bearing structure in a weightless environment. The circulatory system explicitly designed to counteract the effects of gravity begins to break down. Both the former Soviet and the American space programs had to, and continue to have to confront this and related physiological effects that visit the space traveler on even relatively brief missions. How much more profound the changes for possible missions of years and eventually generations will be is a matter of speculation, but is also almost certain to alter us as a species.

The reasons for such a change are locked into the environmental non-social processes that have shaped all life. We are designed to optimize our viability in the terrestrial context from which we evolved. All life conforms to this most elemental principle of existence. It is but a logical extension to expect similar responses as we move off and away from this world.

There is a political dimension to this strand. It is significant and profound; revolving around basic conflicting interests and identities, which are at the heart of most things political. We've already had an historical episode to offer an insight into the potential for colonizers to come into conflict with those on the home world. During one of the early Apollo missions the crew, grating under the pressure to perform a densely packed set of experiments and other mission activities rebelled. The mission commander radioed to mission control that the crew was going off-line for some sleep. Mission control was helpless to prevent the rebellion given the obvious investment in the success of the program and the public perception of the astronauts as American heroes. Yet, if not for those unique conditions, the astronauts would have certainly been court-martialed, at the very least, for insubordination. Their lever of star power (pardon the pun) set within the context of cold war politics and a high consensus national goal to reach the moon first prevented them from any adverse consequences. This specific rebellion was carried out successfully. Subsequent rebellions might have very different outcomes.

At the end of the day, space colonization may come to mimic the colonization experience of 300 years ago. Settlers will come to adapt to whatever new environment they are placed. The adaptation will include cultural shifts that diverge from the home world. The resulting reprioritizing of social values leads to alienation (perhaps in every sense of the word), political conflict and a rising sentiment for independence. That the conflicts between the home world and off-world colonies will be function of their respective interests and not spring from identifying the other as another species will not blunt the force of the conflicts very much. After all, most of our most frequent and most savage wars tend to be internal wars such as our own American Civil War. Dehumanization of the foe occurs after the prior elements that lead to conflict are already in place.

That the physical body will change in a space environment is certain. That interests will diverge between our home world and colonies leading to conflict is also certain. What becomes less so is the extent to which an off-world, post-Homo sapiens culture will come to supplant Homo sapi-

ens on the home world in any scenario short of the passing of the planet itself. Assuming the bonds of material dependency with the home world come to be cut, the very conditions that create the post-sap may work against its design ever being viable in a terrestrial environment. The more probable scenario might simply be the eventual marginalization of Homo sapiens by the successful expansion of their extraterrestrial seed. A bond of sentimental acknowledgement of post-saps ancestry may preserve Homo sapiens, but in a status emulating that of endangered species in a national park. The locus of history will simply pass to elsewhere in the solar system and beyond much as history passed from the riparian cultures of early civilizations to the Mediterranean epoch and by turns to the Atlantic Cultural ecology to the Pacific (Thompson, 1984).

Virtual Reality

The penultimate channel into which the species may flow is brought into focus through the frequent references in popular science fiction over the past 15 years or so, chiefly in the writings of cyberpunk master, William Gibson. Gibson's implant saturated world takes the electronic/information technology revolution directly into the brain. This is an environment that goes beyond the Sony Walkman to the Sony In-Your-Ear-Man. Here, the line between externally and internally stimulated perception blurs.

The post-modern and cinema special-effects friendly elements aside, there are deep and long-standing philosophical questions that arise from this genre that have important implications in our information-age world. When one's mind is so completely concentrated or immersed in some technology-mediated activity, where is one really? This question takes us into philosophical ground that extends back to Plato, and has been continually revisited in the Western tradition by such heavyweights as Descartes, Locke, Berkeley, Hume, Russell, G.E. Moore and A.J. Ayer. In the Eastern tradition, the illusionary nature of the material world is even more deep-rooted in the core religious philosophies of Vedic, Buddhist, and Taoist traditions.

The most immediate popular and legal manifestation of this pathway is on-line gambling where human intention is removed from the body and to the CPU of the transaction site. While strictures against gambling were written to include both gambling establishments and gamblers, somehow, on-line gambling relocates individual behavior outside of the

body even when located in a jurisdiction where such activities are illegal, manifesting real outcomes.¹²

As the issue relates to the post-Homo sapiens angle, there is educated speculation that we might be able to someday literally download our minds (or at least our memories) into a computer-like vehicle thus perpetuating at least that aspect of ourselves. What remains utterly problematic is whether the retention of memory would also sport the retention of consciousness. As pointed out by John R. Searle in his review of Ray Kurzweil's *The Age of the Spiritual Machines: When Computers Exceed Human Intelligence* (2001), though computers continue to increase in their capacity to process information, this is not the same as attaining consciousness (Searle, 1999).

On the other hand, there are futurists who see the question of "machine consciousness" as having become a highly relativistic and elastic concept. They see AI skeptics continually moving the cybernetic goal posts as the ability of devices to interact and manipulate environments increases (Searle, 1999). They point out that air travel is now largely under the control of smart machines which regulate a system far too complex for Homo sapiens to manage. The machine consciousness between aircraft, and airports in consultation with weather-sensing Doppler radar, ambient aircraft detection systems, flight path sensors, and a full array of automatic diagnostic and contingency software allow the entire air travel system to function as a virtually seamless whole. Add to this increasingly sophisticated traffic control on urban surface streets, the seamless connections between the supermarket checkout scanner and inventory control, and the highly complex routing systems employed in telecommunications, including the world-wide web; and the case for artificial intelligence, defined as comprehensive system self-regulation, seems quite strong indeed. However, disembodied human intent is not the same as disembodied human consciousness. Such digitalization of human consciousness is still more speculative than real and more conceptual than feasible.

This download-the-brain version of virtual reality as a gateway to a new species is more a refinement of the robotics/prosthetics strand than an entirely new pathway. It has become the working definition of "cyborg",¹³ serving as a synthesis of the problem concerning the humanification of the mechanical beyond the merely cosmetic. By locating the essence of humanity as the mind, and providing it with a superior vessel, the shifting of evolution from being governed by nature to being governed by culture becomes complete. However, we have only succeeded in projecting human intent beyond the body, and not consciousness itself. Human con-

consciousness might be projected out of the corporal body and expressed in other animate and inanimate forms, but not yet human consciousness itself. Perhaps that is what the human compulsion to create is all about, but the transfer of the entire range human experience into writing, music, visual art and cinemagraphic media, or other expressions of legacy still require readers, listeners, observers, and viewers to interpret and re-express intent. Consciousness transference through these media, as well as the media of childrearing and schooling is not merely a normative practice, but an essential feature of our humanity. So this method of transference through media, is a natural extension of what we have already been doing since we began painting on cave walls several millennia ago. Just how we transfer the full multidimensionality of our essential selves to a cybernetic vessel is the current challenge. It seems reasonable to assume this process will be incremental and built upon a body of precedents that will make any social reactions to the process seem analogous to the fears of our essences being transformed into robotic vessels or puppeteered like so many zombies.

Nanotechnology

Nanotechnology is the newest technological strand to manifest itself as a mechanism for supplanting the Homo sapiens. According to the Oxford English Dictionary (1993), the term was coined in 1974 to describe “ultra fine finishing” for industrial engineering applications. The term was popularized in K.Eric. Drexler, *Engines of Creation* (1986), as a technique through which human immortality might be achieved. By fabricating machines at the molecular level instead of merely miniaturizing larger-scale devices a line of robotic pharmaceuticals might be synthesized which would dynamically and continuously repair the human frame, preventing deterioration and decrepitude (Drexler, 1993).

K. Eric Drexler’s *Engines of Creation* is nanotechnology’s own literary reference, promoting a positive and largely uncritical vision of a coming nanotechnology revolution centered on the enhancement of Homo sapiens by maintaining indefinite viability and vitality. The work challenging the implications of such a creation has yet to be written.

Goonatilake (1999), sees nanotechnology as a means of cheaply recording and transmitting our entire global heritage to our progeny. In this application the artifacts of every individual’s legacy might be organized, cataloged and passed on for posterity, possibly spelling the end historical biography and perhaps even anthropology as we know it (Susantha, 1999).

It is clear that nanotechnology as an evolutionary pathway is still in the process of being blazed. The very uncertainty of direction for this technological medium makes it exciting and mysterious. It also takes us out of the familiar environment of human scale and into internal dimensions largely ignored in popular culture. Only recently has the microscopic world become a setting for popular writing and visual media. *The Incredible Voyage*, and *Honey, I Shrunk the Kids*, aside, we are more projective in our predilections to explore the universe, heedless to Alan Watts' admonition that infinity extends infinitely inward and well as infinitely outward. This is probably another example of a patriarchal bias emphasizing the external, "boldly going forth", while suppressing the equally present, yet largely uncharted internal worlds. So with the development of nanotechnology and its pending arrival onto the cultural radar screen, we might anticipate an interesting set of scenarios that will, in turn, circle back to influence just how it will be applied.

Conclusion

It is the fact that this line of association with the species is more a synthesis of the existing strands, notably robotics and pharmaceuticals, (and with Goonatilake - virtual reality) that both discount nanotechnology as a truly unique line and hold it up as the model for understanding just how the species might now evolve out of a combination of technological interventions and not any single genre. This conclusion does not render the categorization scheme outlined above moot, any more than a list of ingredients is useless in the making of a recipe. When coupled with the influence of literary references to the implications and consequences of technologies applied to public policy making, it is not just a good start, but an essential one for better grasping the direction and flow of developments relating to new courses of evolution. This inventory of technologies poised to alter our species is a point of departure for further discussions just what new flavors, textures, and forms of life we might now come to fabricate. The policies we come to employ will be the vessels and temperature settings in which these new forms will be placed to be either marinated, grilled, sauteed, micro waved, toasted, roasted or just left to stew.

Notes

1. Other examples of interspecies-dependent relationships include bees and flowering plants and the evolved strategy of fruiting trees and shrubs to embed their seeds in an animal food source.
2. The industry's most prominent publication web site can be found at: <<http://www.genwire.com>>. An example of developments reported on this site comes from the 6/28/00 abstract:

A groundbreaking collaboration between Zeneca Agrochemicals (Haslemere, U.K.), Greenovation (Freiburg, Germany), academic researchers and international research organizations could result in nutritionally enhanced transgenic rice seed being distributed free to Developing World farmers within just a few years. So-called "Golden Rice" contains three transgenes: two from the daffodil and the bacterial gene, crtI, which is involved in carotenoid synthesis. The resulting plants produce high levels of beta-carotene (provitamin A) and other carotenoids. Severe dietary deficiencies in carotenoids and Vitamin A lead to irreversible blindness and cause some 1-2 million early childhood deaths every year in the Developing World.

Another authoritative web site on food crop genetic engineering is found at: <http://whyfiles.org/062ag_gene_eng/index.html>. Further discussion of the implications of genetic manipulation and post-Homo sapiens emergence will be taken up in the section of this paper specifically devoted to genetic engineering.

3. The recent decision by the American President on *federal* funding of stem cell research, while the focus of intense media interest, could be viewed as beating a dead red herring since it dealt exclusively with the question of federal funding and had no effect whatsoever on private sector research in this and other genetically-related lines of research.
4. Obsessed with a crippled, gloved hand that is standard issue for mad scientists persisting from Dr. No to Dr. Strangelove.
5. The Charley Chaplin film, *Modern Times*, was a cinemagraphic satire on the dehumanizing nature of mechanical production in which the Chaplin character of a factory worker became so overidentified with his job, that placed himself in great physical peril to fulfill his function. While hilarious in effect, it also confirmed the still strong cultural moray that we are what our job descriptions say we are, and that the full scope of our humanity is reduced by our submission to the role of human *resource* rather than human *being*.
6. Frank Capra, in *Why We Fight*, ingeniously used the NAZI's and Imperial

Japanese's own propaganda imagery with his own voice-over to highlight the mechanical nature of their respective visions of social order.

7. At present we are witnessing a clash of the titans, pitting the all-things-to-all-people-in-a-box-approach exemplified by Bill Gates and his Windows operating systems, versus the smart-appliance approach of the founder of Sun Microsystems. Both approaches have similar outcomes as both imbue machinery with more and more "personality". This telecommunications revolution is also viewed darkly as subverting human freedom. While no longer chained to one's desk, one is instead leashed to the office via the cell-phone, pager, or fax; available for summons anywhere and anytime. Such variations on the automata-as-threat theme perpetuate the notion of robot as a contender for primacy over human order. However, the very concern over this possibility predicts its unlikelihood. The miniaturization of communications technology is simultaneously liberating and threatening to our notions of privacy. Court rulings at every level have consistently protected citizens from the government's gaze, but there are several private sector breaches of this value in everything from mall video surveillance to the tracking capabilities of internet services, to the Safeway Club card, and to the Pentium III processor.
8. This "yin-yang" unity of opposites expressed in a single ideogram extends throughout the sinified Far East where "medicine and poison are located in the same word. A foreign initiate to the Korean language learns that there is only a most subtle difference in aspiration between toothpaste and rat poison, the terms loosely romanized as "chi yak and "ji yak" respectively. (The "j" in Korean romanization is aspirated much as the English "ch". The romanized "ch" is highly aspirated to resemble a "tch" sound.
9. Over the past 20 years or so, however, legislating bodies have come around to reconciling the contradiction between the medical and legal definitions of narcotics by classifying psychoactive substances as controlled substances.
10. See "A Brief History of the Internet" found on the Internet Society web page, <<http://www.isoc.org/internet-history/brief.html>> J.C.R. Licklider who later head the Advanced Research Projects Agency (ARPA), is credited with first conceptualizing the internet. ARPANET would eventually evolve into the internet we are familiar with today. While it is true that ARPANET was not specifically developed for nuclear war survivability, as popular rumors had it, there were clear defense-related uses that helped to maintain the funding rationale for ARPANET.
11. One can make a persuasive case that the most influential individual in the 20th century was Walt Disney. Who first animated tales that tapped into the universal mythic themes that cut across our planet's cultures. Later, he materially displayed a high-tech/deep myth utopia (Disneyland/Disney World) effectively made this an "American century", sealing the fate of state socialism which could never reconcile its promise of a worker's paradise with its practice of smothering centralized control.

12. For instance, the State of New York claims jurisdiction over the CPUs of on-line gambling servers located in Antigua. Congressional regulation of internet gambling has gotten bogged down in trying to sort out exceptions to proposed federal anti-gambling laws which include the usual suspects; Las Vegas, Indian gaming casinos, and other venues where gambling is legal. See, "As Video Poker Dies, Web Sites Thrive", *Atlanta Journal Constitution*, (Sunday Home Edition), September 9, 2001, (Metro News) pg. 1E. Note also that the MGM Mirage, one of the largest U.S.-based casino groups is receiving an on-line casino license to operate (ironically) on the Isle of Man. See, "IoM Awards Three Online Casino Licenses Liesure Sportech, Stanley Leisure and MGM Mirage First in Line, Financial Times (London), September 17, 2001, (Companies and Finance UK) pg. 28.
13. See "Tangent: Cyborg Consciousness", <<http://www.carleton.ca/~claughli/tutcybor.htm>>. Here Laughlin cites Donna Haraway's "A Manifesto for Cyborgs, (1985, 1991), and skillfully points out that much of the literature subsequently derived from Haraway's thesis has been, "... undisciplined, metaphorical applications of the cyborg concept in the interests of so called postmodern criticism. As a consequence of the theoretical and empirical naivete of many of these writers, the significance of the real cyborg, as opposed to the metaphorical use of the concept, has been missed." Laughlin goes on to develop a 4-stage evolutionary pathway for cyborgs starting with conventional prosthetics and culminating in the eventual replacement or augmentation of parts of the central nervous system.

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