FROM HUMAN TO TRANSHUMAN:
TECHNOLOGY AND THE RECONSTRUCTION OF THE WORLD

In 2001, the philosopher Andy Clark published a book entitled *Natural Born Cyborgs*, in which he argued that humans had always been cyborgs. In fact, he and others claim that our major competitive advantage as a species lies in our brain's unique and innate ability to couple to external social, economic, information, and technological systems in such a way as to evolve distributed cognitive networks. He is one of a growing number of scholars arguing not that we will become transhuman, but that we already are.

But what is it we already are? The World Transhumanist Association (www.transhumanism.org) defines "transhumanism" as:

> 1) The intellectual and cultural movement that affirms the possibility and desirability of fundamentally improving the human condition through applied reason, especially by developing and making widely available technologies to eliminate aging and to greatly enhance human intellectual, physical, and psychological capacities.
>
> (2) The study of the ramifications, promises, and potential dangers of technologies that will enable us to overcome fundamental human limitations, and the related study of the ethical matters involved in developing and using such technologies.

There are significant and growing arguments over whether "transhumanism" is a desirable direction for humanity to be going. Some argue in favor of human enhancement and a continuation of medical progress, others against it on equitable grounds, and even on the basis that it constitutes blasphemy, a primordial sin against the order that God has established, the Great Chain of Being that gives us all our place.

I will not suppose to answer the values questions here; that is for each of you to decide. Indeed, I would like to suggest that the primary benefit of the discussion about values is how it so wonderfully illustrates how all of us – intellectual elite, working educated, undereducated and falling behind – are increasingly incapable of framing the world we already have created, much less that which is even now coming into being around us. Even as technology and its concomitant social, economic, organizational and, yes, cognitive changes evolve around us, we fall back into classic European Enlightenment terms: human liberty, egalitarianism, the Christian Great Chain of Being and thus the

blasphemy of engineering ourselves, the individual as the meaningful unit of cognition. All around us is the evidence of our first terraforming adventure – and it is not Mars, it is the Earth. And yet we know it not. We are strangers in our own strange land; homeless because we have been turfed out by our very successes. As Stewart Brand put it in his

first Whole Earth Catalog in 1968, "We are as gods and might as well get good at it." So far, we fail that test, and we do so for reasons that Heidegger stated succinctly:

> So long as we do not, through thinking, experience what is, we can never belong to what will be. . . . The flight into tradition, out of a combination of humility and presumption, can bring about nothing in itself other than self deception and blindness in relation to the historical moment.[1]

We are as gods. The pivotal moment this became clear was 1945, in the deserts of New Mexico, when a human sun burst into being for the first time. Robert Oppenheimer, standing in the stark shade cast by a nuclear bomb, reacted, ""Now I am become Death, destroyer of worlds." Note the profound shift in perspective, from Vishnu in the Bhagavad Gita to a mere mortal in awe not of what God or Nature had visited upon us, but what we had built for ourselves. We have since gotten used to, almost blasé about, nuclear winter, almost the way a two year old gets used to a loaded .357 magnum lying on the floor within easy reach. We are as gods? No, for we have created the power but not yet the mind. And with accelerating technology, we have little time to waste.

So in this lecture, I will try to do several things. First, I will briefly discuss the fundamental aspects of this Age of Humans, this Anthropocene as scientists are calling it, which have so profoundly undermined our old and comforting Enlightenment assumptions. Second, I will touch on technology, and the truly transformative wave which towers above us, ready to crash down, always, I hope, remembering that technology is a cultural, even an existential, force, not just things. Thirdly, I will suggest the need to reconstruct our world. In this, I am not just suggesting that we are moving to a level of complexity and integration of human, natural, and engineered systems that we at present can at best barely glimpse through the fog of our outdated preconceptions and ideologies. That, I take to be a given. Rather, I am suggesting that, without a new and difficult ascension to a rationality suitable for a world in which "all that is solid melts into air," (in Marx's words), we forfeit our already tenuous hold on responsibility and on ethics. Indeed, we forfeit our right to be considered sentient beings.

The Anthropogenic Earth

We live in a world that is fundamentally different from anything that we have known in the past. In one sense, we have simply begun to perceive that which thousands of years of human history have created, although the Industrial Revolution undeniably accelerated the process. It is a world dominated by one species and the activities and products characteristic of that species, from automobiles to cities to the creation of vast new cyberspaces. It is a world where the critical dynamics of major earth systems, be they atmospheric, biological or radiative, or for that matter cultural, economic, or technological, increasingly bear the imprint of the human.

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[1]M. Heidegger, *The Question Concerning Technology and Other Essays*, translation by W. Lovitt (New York, Harper Torchbooks, 1977), "The Turning," p. 49; "The Age of the World Picture," p. 136.

I cannot in a short lecture begin to weave an understanding of the complex adaptive systems that increasingly characterize this anthopogenic planet, but a small set of examples might provide a glimpse of what we have already wrought.

1. Every planetary body has a characteristic radiation emissions spectrum . The Earth's spectrum, however, is not just a matter of reflections from clouds, emitted infrared radiation, and the like. Rather, it includes television and radio broadcasts, and leakage from all sorts of technologies. Remember that picture of the Earth from space at night, and the electric lights spread over North America, Europe and Asia. In the Anthropocene, perhaps the most fundamental physical aspect of our planet, its radiation spectrum, carries our signature on it.

2. Virtually everyone is aware of global climate change, which vies with terrorism for existential catastrophe billing. Stand away from the Kyoto Treaty and the surrounding hysterics pro and con, however, and take a little longer perspective. What that process represents, fitful and ad hoc as it is, is the dawning of a realization that, regardless of what we do with Kyoto, our species will be engaged in a dialog with our climate, our atmospheric chemistry and physics, and the carbon cycle so long as we exist at anywhere near our current numbers on the planet. We can reduce – more likely, redistribute - some of our impacts on these complicated and interrelated systems, but we will not eliminate the growing human influence. Moreover, these particular perturbations are all part of interconnected global systems, and a population of over six billion humans, each seeking a better life, ensures that our overall role in global systems will increase absent some sort of population crash. And be careful if you wish for this under your breath, for such a catastrophe, whether from nuclear winter, terrorism and response, or other source would create havoc among all systems, human, natural, and built.

3. Among the most recognized truths of our age is the idea that we are experiencing a "crisis in biodiversity" as human activity causes extinction levels to skyrocket. But some note that even if the decrease in evolved biodiversity is as steep as alleged – something that the underlying data are surprisingly sketchy on – this may not be true given the rise of what scientists call "synthetic biology." Over the past decades, scientists and engineers have begun the project of understanding and designing new forms of life. These efforts, from genetics to agricultural science, have coalesced into a new field called "synthetic biology". Synthetic biology merges engineering with biology by, among other things, creating standard biological components that can be mixed and matched in organisms to provide desired functions. This allows researchers to treat biological pathways as if they were components or circuits, and to create organisms from scratch – not to mention extending beyond existing biological systems by, for example, creating life based on different genetic codes than those found in the wild. MIT, for example, has established a Registry of Standard Biological Parts ("BioBricks") that can be ordered and plugged into cells, just like electronic components. The 2005 Intercollegiate Genetically Engineered Machine (iGEM) competition held at MIT in November 2005 attracted 17 teams, with designs that included bacterial Etch-a-Sketches, photosensitive t-shirts, and bacterial photography systems, thermometers and sensors. Somewhat controversially, a number of viruses have been assembled from scratch,

including the viruses for polio and the 1918 flu epidemic. Other researchers have engineered the genes of *Escherichia coli* to incorporate a 21st amino acid, opening up an option space for design of biological organisms that has been unavailable to evolved biological systems for billions of years. Commercialization of these biotechnologies continues to accelerate, led by the introduction in agriculture of genetically modified organism (GMO) technology. But GMO technology extends far beyond agriculture; according to the Economist, in 2004 some 5% of world chemical output was estimated to derive from genetically engineered technologies. Reflecting the on-going commoditization of life, figures for biotechnology patent filings in OECD countries continue to rise sharply.

Synthetic biology does not just reconfigure the biological sciences; the potential implications are far more profound. To begin with, biodiversity becomes a product of design choices, and industrial and political imperatives (security issues, for example), rather than evolutionary pressures. More broadly, the behavior and structure of biological systems increasingly becomes a function of human dynamics and systems, so that understanding biological systems increasingly requires an understanding of the relevant human systems. In short, biology increasingly becomes a cultural science.

One important implication of this anthropogenic biology is that the contingency that characterizes human systems comes to characterize biological systems. To take an obvious marketing example from conservation biology, in an arbitrary and profoundly cultural process some species are preserved because they are charismatic megafauna: pandas, tigers, or whales. Many, many others go extinct because they are only insects, or plants, or ugly, or unknown; a few, like smallpox, because humans detest and fear them (with the important proviso that, in an age of biotech, national security and terrorism, extinction, at least for viruses and bacteria, is never forever).

These, then, are just examples of the anthropogenic – the human made – Earth. As the journal *Nature* put it in an editorial in 2003, "Welcome to the Anthropocene," roughly translated, the Age of the Human.[2] But it is not just that our technologies construct a human Earth; it is far more complicated. For technologies are more powerful than we generally recognize, and those technologies are now not just ever more powerful means to integrate previously natural systems into human systems, but also to make the human itself a design space. Accordingly, I now turn to a brief discussion of technology.

Technology and Creation

Any meaningful discussion of technology in the age of the Human Earth must begin by making one critical point: technology is an integrated cultural process, not a collection of things. For example, in the middle 1800's as it began its rapid expansion phase, the railroad was not just the most impressive piece of machinery most people ever saw: it was a sociocultural juggernaut. Among the changes the railroads brought in their wake:

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[2] *Nature* 424:709. Note that this terminology simply reflects the extent of human impact on planetary systems, and is not a comment on the respective merits of secular versus religious viewpoints.

1. Railroads required a uniform, precise system of time, and thus created "industrial time" and its associated culture
2. Railroads created the need for, and co-evolved with, national scale communications systems (telegraph);
3. Railroad firms created modern managerial capitalism (modern accounting, planning, and administration systems);
4. Railroad firms created the modern capital and financial markets (railroad construction was the single most important stimulus to industrial growth in Western Europe by 1840s);
5. Railroads in the United States became a potent symbol of national power, and, more subtly, instantiated and validated the US integration of religion, morality and technology, both pro and con: "If God had designed that His intelligent creatures should travel at the frightful speed of 15 miles an hour by steam, He would have foretold it through His holy prophets. It is a device of Satan to lead immortal souls down to Hell." (Ohio School Board, 1828);
6. Railroads transformed landscapes at all scales. Chicago existed, and structured the Midwest economically and environmentally, because of railroads;
7. Like most major technological systems, railroads fundamentally changed US economic and power structures, validating the US nation-state and Manifest Destiny and restructuring the economy from local/regional business concentrations to trusts (scale economies of national markets); and, finally;
8. Railroads dramatically changed the underlying teleology of American culture, changing it from Jeffersonian agrarianism, an Edenic teleology, to a technology-driven New Jerusalem, a cultural schism that replays itself today in the continuing environmentalist challenge to technology.

This last point, the shift from technology as challenge to Agrarian Eden, to technology as means to achieve the New Jerusalem, is a critical step in both the relationship between technology and theology, but also in the embrace of technology in the New World. Consider some selected sections from Walt Whitman's 1868 "Passage to India":

Singing my days,
Singing the great achievements of the present,
Singing the strong light works of engineers,
Our modern wonders (the antique ponderous Seven outvied,)
In the Old World the east the Suez Canal,
The New by its might railroad spann'd . . .

I see over my own continent the Pacific railroad
surmounting every barrier,
I see continual trains of cars winding along the Platte carrying freight and passengers,
I hear the locomotives rushing and roaring, and the
shrill steam-whistle,
I hear the echoes reverberate through the grandest scenery in the world . . .

After the seas are all cross'd, (as they seem already cross'd)
After the great captains and engineers have accomplish'd their work,
After the noble inventors, after the scientists,
the chemists, the geologist, ethnologist,
Finally shall come the poet worthy that name,
The true son of God shall come singing his songs.

Then not your deeds only O voyagers, O scientists and inventors, shall be justified, ...
This whole earth, this cold, impassive, voiceless earth, shall be completely justified, ...
Nature and Man shall be disjoin'd and diffused no more,
The true son of God shall absolutely fuse them . . . .

"The true son of God shall absolutely fuse them" – thus comes unity between God, human and Nature, the Second Coming, in the form of New Jerusalem, to the New World – and it comes on rails of steel. This is not technology as economic value, or as guarantor of national security, this is technology as salvation.

And railroads are only an example of what economic historians call technology clusters that power so-called "long waves" in economic and social history. Railroads and steam technology powered a wave from about 1840 to 1890; steel, heavy engineering and electricity, from about 1890 to 1930; the automobile, petroleum, and aircraft from about 1930 to 1990; the information cluster with its computerization of the economy, from about 1990 to the present. While the dates are somewhat imprecise, the general idea of clusters of technology – which, it cannot be emphasized enough, always carry with them institutional, organizational, economic, cultural and political changes – is a useful one. Thus, specialized professional managerial systems and associated "Taylorism" industrial efficiency techniques characterized the heavy industry cluster, while a far more networked, flexible structure began to evolve during the information cluster.

But the railroad example makes several general principles of technological evolution crystal clear. First, a technology of any significance will destabilize existing institutions and power relationships and thus, to some degree, cultural assumptions. Accordingly, it will be opposed by many. Second, projecting the effects of technology systems before they are actually adopted is not just hard but, given the complexity of the systems, probably impossible. Thus, for example, the time structure that we moderns take for granted was not the time structure of pre-railroad American agrarian society; it is a product of our technology. This raises a more subtle, but equally important point: we are able to perceive our world, and create our cultural constructs, only through the lens that our technology provides.

If the history of technological evolution is a warning, it is an inadequate one for the wave bearing down on us. Technological change, as suggested by the example of the railroads, is always potent, but now we have not just one or two enabling technologies undergoing rapid evolution, we have five: nanotechnology, biotechnology, robotics, information and

communication technology (ICT), and applied cognitive science. These technologies in some ways are the logical end of the chapter of human history that began with the Greeks. Nanotechnology extends human will and design to the atomic level. As for biotechnology, J. R. McNeill, an environmental historian, notes that

> By the twentieth century, our numbers, our high-energy technologies, and our refined division of labor with its exchange economy made us capable of total transformation of any and all ecosystems. . . . In the twentieth century we became what most cultures long imagined us to be: lords of the biosphere.[3]

ICT gives us the ability to create virtual worlds at will, and facilitates a migration of functionality to information rather than physical structures. Thus, money used to be coins and paper bills, themselves mere symbols of value, but now even that physical premise is gone. Money is electrons somewhere in cyberspace, and financial instruments have become so mathematical that no one can figure out anymore which shell the risk is hidden under. That, not a sub-prime market for mortgages, is why we are now quietly trying to sneak out of a financial crisis. Meaning in an information dense world has become contingent on belief and noise level, which is why Fox News and blogs proliferate, and the great globe itself, yea, all which inherit, become media.

Consider for a brief moment some of the implications of the NBRIC wave in just one area, human biology and cognition, as an example of some of the possibilities. At one extreme, some predict the achievement of "functional human immortality" within fifty years, either as a result of continuing advances in biotechnology, or as ICT and computational power enable downloading of human consciousness into information networks. This latter should not, however, be confused with the growing power of human/Internet cognitive networks, which arguably give rise to such a different form of extended cognition that it might be considered the first varietal of post human humanity. While such predictions are viewed by most experts as highly unlikely, there is a growing consensus that substantial extensions of average lifespans, with a high quality of life, are achievable in the next few decades. For example, the IEEE *Spectrum*, a mainstream technical journal, ran a series of articles in 2004 on engineering and aging which concluded that using "engineered negligible senescence" to control aging will allow average ages of well over 100 within a few decades. What is interesting, of course, is that, even though the scientists and technologists are perceiving such possibilities as age extension as increasingly probable, those in other areas of science, and in policy, and in the environmental and sustainability communities, remain unaware of these possibilities, despite their obviously challenging implications (for pension and old-age systems, and material and energy consumption patterns, for example). Equally challenging, it is becoming apparent that not just the Earth, but the human, is in the process of becoming a human design project and that substantial changes in what it means to be human are probably inevitable (although specifics are unpredictable). N. Katherine Hayles, for example, in her aptly named book, *How We Became Posthuman*, traces the evolution of

[3]J. R. McNeill, 2000, *Something New Under the Sun* (New York: W. W. Norton & Company), pp. 193-194.

the posthuman through the concepts of homeostasis, then reflexivity, then, finally, virtuality. While Hayles is cautious about the implications of this on-going and accelerating process, some foresee enormous potential: Roco and Bainbridge in an NSF report entitled *Converging Technologies for Improving Human Performance*, for example, conclude: "With proper attention to ethical issues and societal needs, converging technologies could achieve a tremendous improvement in human abilities, societal outcomes, the nations's productivity, and the quality of life." They continue:

> Examples of payoffs may include improving work efficiency and learning, enhancing individual sensory and cognitive capabilities, revolutionary changes in healthcare, improving both individual and group creativity, highly effective communication techniques including brain-to-brain interaction, perfecting human—machine interfaces including neuromorphic engineering, sustainable and "intelligent" environments including neuro-ergonomics, enhancing human capabilities for defense purposes, reaching sustainable development using NBIC tools, and ameliorating the physical and cognitive decline that is common to the aging mind.[4]

Effects of technological convergence on the human is only one small area of research and speculation; similar suites of possible scenarios are being developed in many other areas. It is obviously premature to regard most of these predictions as anything more than possible outcomes. Indeed, much of the thinking of technological futures is marked by a strong tendency to focus on a particular aspect of a technology or its implementation, implicitly holding other social, technological, or environmental systems fixed. This almost automatically assures that the scenarios are implausible, because technological change, especially at this fundamental level and across virtually the entire technology salient, is integrated with most other human systems and under such conditions they too will be evolving and contingent. Additionally, except for the easy cases where particular applications of these core technologies are already in the process of being commercialized, it is very difficult to determine how probable even the most outré scenarios might be. The line between science fiction and tomorrow's headlines has seldom been quite so blurred, in part because technologies frequently tend to follow cultural precedents, which are often established in science fiction. Thus, for example, the structure of virtual realities shows a strong resemblance to the work of writers such as Gibson and Stephenson . . . and, accordingly, not only is it hard to tell the difference between fiction and soon-to-be fact; the latter are constructed in fact by the former.

We have thus far made four critical points regarding technology and the human:

1. Technological change is not an isolated event. Rather, it represents movements towards new, locally stable, earth systems states. These states integrate natural, environmental, cultural, theological, institutional, financial, managerial,

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[4] Roco, M. C. and W. S. Bainbridge, eds. 2003. *Converging Technologies for Improving Human Performance.* Dordrecht: Kluwer Academic Publishers, page ix.

technological, built and human dimensions, and even construct our sense of time. Technologies do not define these integrated earth system states, except by convenience, but technological evolution can destabilize existing clusters and create conditions leading to the evolution of new ones.

2. Technology is the means by which humans have expressed their will to power. This is not just an academic observation. Cultures that develop technology, and, importantly, create frameworks within which it can react upon itself and so accelerate its own evolution, thereby gain cognitive power over competitors. Because technologies create such powerful comparative advantages as between cultures, those cultures that attempt to block technology will, all things equal, eventually be dominated by those that embrace it. Thus, it is likely that technological evolution will be difficult, if not impossible, to stop, as some argue. Whether and how it can be moderated in the age of global elites becomes an important research question.
3. The rate of technological change is not slowing, but rather accelerating dramatically. In doing so, it is stretching the bimodal distribution between those who constitute the global elite and who, primarily through education and culture, are able to prosper under such conditions, and those who are left behind. The latter have a strong tendency to seek stability in outmoded ideologies and fundamentalist movements. These movements are desperate responses to a world that, for such individuals, has become irrational, and, as it destabilizes patterns of belief and behavior they invest with meaning, profoundly challenging and frequently evil.
4. Current technological evolution is unprecedented. Previous technology clusters revolved around one or perhaps two evolving technologies – say, rails and steam, or automobiles and petroleum. The constellation of nanotechnology, biotechnology, robotics, ICT, and cognitive science, however, marks a culmination of sorts of traditional technological evolution, for among other things it extends control of materials to the atomic scale, and lays the groundwork for the complete integration of the human and the technological. The Earth, biology, and indeed even the human itself become design spaces and, in doing so, render contingent virtually all of what we have taken to be fixed.

The Undermining of the Enlightenment

To summarize where we are at this point: the integrated cluster of technology that is rapidly beginning to redefine our world – NBRIC, or nanotechnology, biotechnology, robotics, ICT, and applied cognitive science – is both providing the scientific and technological basis for dramatically accelerating transhumanism, and obsoleting the mental models and cultural constructs through which we attempt to understand transhumanism. In particular:

1. We face radically increasing complexity of at least four different kinds: a) static complexity (increasing numbers of components, stakeholders, interactions among different infrastructure, and linkages among them, for example); b) dynamic complexity (as these factors interact in new and

unanticipated ways, especially given the fundamentally changing nature of ICT systems); c) "wicked" complexity (arising from the need to engineer and manage integrated human/natural/built systems increasingly displaying the reflexivity and intentionality of human systems and institutions); and d) scale, as we realize we must begin to design, engineer and manage integrated human/natural/built earth systems at not just national, but regional and global scales. This complexity has already had profound institutional implications in our era: Marxism in the Soviet Union and China collapsed not from external conquest or even from Reagan's vaunted spend race, but rather because the centralized economic model adopted by large Marxist societies simply became incapable of managing the complexity inherent in a modern industrial economy. And please note that our economies, financial networks, and technologies have become far more complex since then. We cannot centrally control the global economy anymore; indeed, it may be impossible to centrally conceptualize it for much longer. More fundamentally for many of us, the complexity in which we are now all embedded is eroding the unitary sense of self that was one of the principle gifts of the Enlightenment: not only are we fragmenting our memory across various Internet systems, but as we build avatars that represent different aspects of our personalities to play in different virtual realities, we create a multidimensional self that would have been simply impossible a hundred years ago, in a small town environment. Thus does the complexity that makes transhumanism possible at the same time invalidate the framework that we have previously associated with the human. The mental model of the human expressed in concepts such as the Great Chain of Being and the Enlightenment focus on the individual has not been displaced by an alternative formulation, but rather rendered obsolete by accelerating complexity that it was unable to frame.

2. An important element of this complexity is that it confirms an unavoidable relationship between observer, frame of reference, and derivation of partial and contingent truth from underlying complex systems. Consider a simple example. If I am interested in the rates of crime in Phoenix, I am also implicitly defining the urban system by its political boundaries. If, on the other hand, I am interested in water and Phoenix, I am implicitly defining the system as including the Colorado River basin, not to mention American water law, patterns of tourism that make golf courses popular in Scottsdale, and xeriscaping initiatives. Yet in both cases the relevant marker is "Phoenix." What is happening, simply, is that my query to the system calls forth from an underlying complex noumenal world a particular network that is responsive to my query (in Kantian terms, the query acts to define an appropriate phenomenal structure from a complex pattern of "things in themselves" that is not directly accessible). In short, complex urban systems can be thought of as interconnected, evolving networks of networks, covering not just the familiar subjects of urban engineering – built environments and infrastructure – but less physical ones such as technology states, lifestyles, cultural constructs, economic evolution, and the like. Thus, while it is true that Chicago is a collection of buildings, roads, stores, and so forth, it is also true that Chicago

is the mechanism by which much of the American Midwest was commodified. The networks that are of interest in a particular situation will generally be determined not by the system being evaluated, but by the particular questions being asked about it. There is a similarity to quantum mechanics here: what you perceive when you look at the system is determined by the purpose for which you are observing it. The system itself always remains more complex than you are able to capture at any one time. And the important corollary is that a complex system can only be defined in terms of the reasons for which a definition is desired. The query identifies the particular networks of the system that are relevant, and they in turn define the boundaries of the system for the purpose of the inquiry. This reflexivity complicates any discussion of a complex system, of course, and reduces the value of standardized or ideological approaches. Equally important, these integrated systems are completely built by humans, but their dynamics and evolutionary paths are not planned, nor determined, by humans, and their effects ripple broadly across many human, natural and built systems at many scales. They are thus excellent examples of systems that, like the Internet, are completely anthropogenic, but are not understandable or transparent. When we design the human, to paraphrase Marx, humans will make themselves, but they will not make themselves just as they please, for our understanding and the complex nature of reality are not congruent, but coupled weakly through our queries to the latter.

3. The accelerating evolution of technology systems, especially ICT, combined with the postmodern fragmenting of time, space and culture, dramatically decreases the stability of all cultural constructs. In our particular case, it has two profound effects: it renders not just the social and cultural landscapes that we look out on more unstable, but it renders that which looks out – the self and our individuality – more contingent as well. The dramatic increase of fundamentalism across most belief systems and in most societies reflects, in part, an effort to create a stable ground; it is an effort that will fail, at least for the elite for whom transhumanism is already a reality. Marx's prediction – or curse, depending on your viewpoint – comes true: all that is solid melts into air. Note that this does not mean that the postmodern solutions of absolute solipcism and relativism are valid; it simply means that if our mental models and cultural constructs are to be adaptive, they must embrace, and manage, their own contingency.
4. Transhumanism is often viewed, particularly by opponents, as some sort of victory of technology over the human, as if each were a separate domain. The Enlightenment Romantics had their Frankenstein model, and it remains powerful today (as in Greenpeace's Frankenfood PR campaign). If history is any guide, this is at best a temporary opposition. Thus, the dialectic process proceeds by a thesis giving rise to an opposing antithesis, which after conflict create a new and more powerful thesis. In this case, then, what we can anticipate is not that the human and the technological will clash, and one will emerge victorious; rather, what is already happening is that the two are merging. This does not mean profound changes won't occur, especially in

older concepts of what constitutes "the human." Nor does it mean that we won't see varietals of humans – as, indeed, the "digital natives" that are comfortably embedded in their ICT networks may already be. At the level of "nature," it means that we should expect integrated human/natural/built earth systems, rather than those we currently idealize. Indeed, some current "mashups," where representations of the real world are mixed on-line with virtual representations of data sets or imaginary spaces, are already going in that direction.

5. Many groups, from deep greens (ideological environmentalists) to Marxists to religious conservatives opposing modernity, cling to ideologies and older worldviews implying necessary and foundational conflict between the human and technology, in the shape of the transhuman, for obvious reasons. It engages their base; it turns complex questions of fact into simplistic black and white scenarios; and, in many cases, it both reflects and validates their rejection of modernity. But ideological approaches of all kinds are particularly problematic at the dawn of the anthropogenic world, which as we have seen is characterized by exceedingly rapid and profound change in fundamental relationships and systems, involving natural, built and human systems of extraordinary static and dynamic complexity. In such a context, there are four aspects of ideology that render it especially dysfunctional. First, any ideology is necessarily a simplification of reality; in fact, that's usually an important part of its mass appeal. Second, the elements and structure of this simplification necessarily lie in the past, not the future, and thus embed assumptions and implications that are necessarily increasingly anachronistic in a period of rapid and discontinuous change. Third, ideology creates an "ends justify the means" mentality; almost by definition the power of the Idea trumps the messy and contingent real world. Thus, it is characteristic of many ideologies that they posit a vision of utopia, the achievement of which is worth the sacrifices, usually imposed by the ideological group on others – think of Marxism, or of the poverty in this country because of our powerful anti-tax ideology, or the millions of people who have died from malaria in developing countries because environmentalists blocked access to DDT. Regarding transhumanism, ideology can lead some opponents to glorify suffering and denigrate modern medicine – almost always imposing the costs of their beliefs on other, conveniently impersonalized, groups. Finally, as part of the elevation of the Idea over the real, ideology also cuts off information transfer and dialog, and is profoundly anti-democratic, anti-intellectual, and anti-rational (although, ironically, ideologies are creatures of the intelligensia). It is not, then, just that ideologies are generally bad, although many of them seem to be in application, as any familiarity with the 20th century would confirm; rather, it is that ideologies are *especially* bad in a period of rapid, discontinuous, and fundamental change at a global, multicultural scale. Because ideologies, with a quasi-rational and thus Enlightenment mien, have over time become a convenient way of simplifying a complex environment, their failure not just in practice but in principle is a further weakening of the original Enlightenment project.

6. It is difficult to argue, especially for classic liberals, but it may well be the case that perhaps the changes we are currently beginning to experience mark, in fact, the end of the great Enlightenment project of radical democratic power. To begin with, it is clear that the rates of change we are now experiencing has already created a fundamentalist backlash that is increasingly potent around the world. This is occurring in virtually all major religions, as well as those belief systems – environmentalism, sustainability – that for many people, especially in secular societies, now begin to serve theological purposes. This is not random opposition to modernity, but generated by the fact that, as rates of technological change accelerate, increasing numbers of people in every society are disenfranchised. They are incapable of keeping pace with continuing change, unable to integrate into the information webs that increasingly define human cognition, and aghast at the changes in lifestyle, income distribution, relative power relationships, and changes in sexual and family roles and structures that have resulted. And, importantly, these groups have not yet understood the degree to which their fundamental values are rendered contingent by that self-same progress. Thus, accelerating technological change can only increase opposition to itself, and yet it is an important component of technological dominance. For those for whom Enlightenment representative democracy is an important value, then, transhumanism creates a difficult conundrum, for the more it succeeds, the more it creates an activist opposition which hobbles it in democratic cultures, giving the advantage to cultures where the elite, who benefit from technological evolution generally and transhumanism specifically, are able to exercise control. Thus, what has been a world marked by international patterns of inequality is increasingly becoming a world where an elite skilled in navigating complex and information dense environments dominates, and more and more others sink into a global proletariat.
7. The political implications of transhumanism do not just suggest the undermining of democratic structures as authoritarian societies become increasingly competent because of greater willingness to support technological change regardless of the cost. There is an obvious and dangerous destabilizing effect associated with foundational technological changes in general, and transhumanism in particular. Most importantly, perhaps, the evolution of human technological competency such that virtually the entire material world (nanotechnology), including the biological world (biotechnology), is potentially subject to human design clearly challenges cultural assumptions about appropriate boundaries between the sacred and the human. This is particularly true for those for whom "nature" has become the repository of the Sacred, a reflection of the Romantic project to protect God from science by shifting the Sacred to the wilderness. This is, indeed, an important foundational belief for many environmentalists, ranging from English Royalty who perceive biotechnology as blasphemous because it is "playing God," to environmental writers such as McKibben, who implicitly frames technological and cultural evolution in Nitzschean terms when he first places God in "nature" and then bemoans the human impacts on the latter:

> Wild nature, then, has been a way to recognize God [of the Christian tradition] and to talk about who He is. How could it be otherwise? What else is, or was, beyond human reach? In what other sphere could a deity operate freely?[5]

More specifically, the transhumanism project, by making the human contingent (indeed, a reflexive design space, as humans and their institutions begin designing humans at the molecular to the cognitive network scale) is the final rejection of the roles assigned to deity, human, and beast in many religious traditions (as in the Christian Great Chain of Being). This does not, in itself, imply a necessary theological conflict, for rebalancing theological interpretation and scientific advance has in some ways been the critical discourse of the last several centuries and authorities dating back to St. Augustine offer the applicable guidance (the necessarily unitary truth of science and theology under an omniscient God). Consider, for example, Pope John Paul II's comments in the encyclical letter, *Fides Et Ratio* (1998; introduction and paras. 34, 43, 48):

> Faith and reason are like two wings on which the human spirit rises to the contemplation of truth. . . . the two modes of knowledge lead to truth in all its fullness. The unity of truth is a fundamental premise of human reasoning, as the principle of non-contradiction makes clear. . . . Both the light of reason and the light of faith come from God . . . hence there can be no contradiction between them. . . . It is an illusion to think that faith, tied to weak reasoning, might be more penetrating; on the contrary, faith then runs the grave risk of withering into myth or superstition.

It can be argued, therefore, that transhumanism is only another step in redistributing responsibility between categories. But this is a theological argument, and the most active conflicts in religion today are not theological, but social and more specifically class, as those who are increasingly powerless in a technological, information dense (and hence free market) environment, whether because of lack of education, or cultural weaknesses in such a competition, strike back through fundamentalism. As these groups begin to understand that transhumanism is already here, and that technological evolution generally and transhumanism specifically is strongly correlated with cultural and economic power, the reaction that has started will intensify, perhaps dramatically. It bears remembering that the invention of printing enabled the spread of literacy and democratization of the Bible, and thence was the technological foundation required for the Reformation – and the result was 500 years of religious conflict across all of Europe.

If my musings are correct, then, transhumanism and the broader technological wave of which it is only the most personal indicator constitute a period of unprecedented and fundamental physical, emotional, psychological, and cultural change. What it means to be human is in play, in ways that it has never been before – and, importantly, in ways that undermine most of the mental models, cultural constructs, and institutional systems we have created to structure our relationships with our selves, our institutions, our politics,

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[5] B. McKibben, 1989, *The End of Nature*, New York: Random House, page 77.

and our conceptualization of our role in the universe and relationship to our deities. We and our world are contingent in a way that, despite the massive changes we have experienced in past waves of technology, we have never been before. Clearly, we will need to reconstruct our world on the run, as it were, and a necessary part of that project will be to reconstruct ourselves as contingent but grounded beings. To that challenge, then, let us turn.

Personal authenticity and the Reinvention of the Enlightenment

Begin by observing that complexity and radical contingency have undermined the Enlightenment as it is now constructed, and as it now underpins global culture. In some ways, this is desirable, as it opens new options spaces for continued evolution of cultures, the species, and individuals. Moreover, this is only an extension of the dynamic that has always characterized the Enlightenment, and, arguably, must characterize any cultural system that successfully evolves. Thus, the Enlightenment as global culture has succeeded, ironically, because it uniquely carries within it the seeds of its own negation as a uniquely "true" or "valid" culture. Indeed, the strongest critics of the Enlightenment have been internal, from Rosseau (whose criticism has become internalized to much of the environmental discourse), to Marx, to the postmodernists of all stripes. Thus, thinkers from Rorty to Adorno have emphasised two paradoxical observations:

1. Only a structure which, like the European Enlightenment, contained its own critique and negation within itself could possibly become the basis for a globalized cultural framework in a multicultural world; and,
2. The Enlightenment framework succeeds only to the extent it continues to negate itself as a unique source of "truth." In these cases, the Enlightenment tradition has not only been the source of the negation, but has itself been transformed, transcended, and made more universal and encompassing, by the dialectic generated by the negation. This dialectical process, perhaps most closely associated with Marx and Hegel, is itself an important and self-conscious facet of the Enlightenment; in fact, much Romantic thought, with the important exception of Rousseau, saw the dialectic as the process by which human progress towards a reintegrated high civilization (in religious terms, recovery from the Fall, which was itself seen as introduced by intellectualization) occurred.

As the original Enlightenment evolved through modernity, the relatively integral worldview it entailed shattered against the increasing complexity of the cognitive networks that it enabled: so now must we transcend – not deny or oversimplify, but internalize and transcend – that complexity anew. The Enlightenment as explicit framing has been transcended yet again by the Enlightenment as process.

This, then, is our challenge: a new Enlightenment, one born not of a single culture or tradition; one that embeds uncertainty, dialog and change, not artificial stability; one that seeks not just authentic individuals, and authentic institutions, but an authentic world; one which, over the decades and centuries and millennia to come, reflects the best of human aspirations. This new Enlightenment arises from, but cannot be sought, in the past, in obsolete and increasingly dysfunctional ideologies or fantasies, for the past defines the boundaries of our path, but it does not therefore define our future. It cannot consist of cultural constructs and mental models that are already anachronistic, even if we can't bring ourselves to admit that just yet. It cannot be simple, for simplistic solutions and visions are dysfunctional in a world that is uncertain, unpredictable, and complex, a mélange of cognitive networks in dances and patterns that, for the most part, we don't even perceive yet. That future we – as individuals, as institutions, as a species – are designing, and will continue to design, even if we don't know what that means, or how to do it – and even if, given a chance, we would try to reject that power. Our choice is not the anthropogenic world, for that is already upon us. Rather it is whether to grow into our responsibilities, to be rational, ethical and authentic within a contingent and constantly evolving framework. It is to raise the contingent rationality of the Eurocentric Enlightenment that is passing into the wisdom of a new global, multicultural Enlightenment. It is perhaps our most profound challenge as a species – but, if we meet it, if we can grow to create a truly authentic world, we will have validated our promise as sentient beings.

Thus, it is fitting that I end with observations on the individual, for it is there that the first and most difficult demands of this age of radical change fall. Current comfortable whimseys, simplifications, and romantic ideologies fail in the face of a complexity that they have contributed to, but are unable to comprehend. Moreover, each individual is, as a matter of existence, defined in contingent and idiosyncratic terms, inherently limited in perceptual capabilities, and characterized by imperfect rationality. Nonetheless, we have created this world together, and have reached the stage where we must now demand a reconstruction of personal authenticity. Let me then close by attempting to identify at least some characteristics associated with the authenticity that the rise of transhumanism and the current state of the anthropogenic Earth calls forth:

1. Following the existentialist formulation (and, for that matter, going back to Socrates' injunction to "know thyself"), an authenticity necessary for our times will require as a first element a recognition and acceptance of the world as it is, not as various ideologies would wish it to be.
2. This in turn implies acceptance of the human condition, in that the anthropogenic earth requires each person to accept the validity of their condition and cognitive networks for themselves, while simultaneously recognizing them as contingent and stochastic in a world characterized by mutually exclusive but equally valid ontologies.
3. It also requires acceptance of the epistemological and existential implications of complex adaptive systems, in that any perceptual or cognitive network, or understanding of a complex system, is created by the query posed to the

system, and thus embodies unavoidable reflexivity between the system and the cognitive network, and implies the contingency and incompleteness of any particular perspective on a complex adaptive system.

4. Given proposition 3, authenticity demands that we must have the integrity to create appropriate queries, since they will structure the cognitive networks within which we operate. Substituting wistful fantasies for honest query and thus construction of our local realities, or gameplaying the query process to create ideologically predetermined local realities, must be rejected as profoundly inauthentic.
5. Authenticity requires that we accept the condition that meaning, truth, and values do not arise from first principles, but are functions of network state, and thus are contingent and continually regenerated in a reflexive dialog between cognitive systems posing queries to, and thus generating configurations of, external complex adaptive systems.
6. Following propositions 4 and 5, authenticity requires accepting as the human condition the challenge that, that which you most believe, you must distrust the most. Meaning, and truth, arise from the dialectical process of their continued rejection.
7. Authenticity requires accepting rationality as partial and constructed, an interplay between different and contingent ontologies and partial structures of underlying complex adaptive systems, congealed intentionality and cognition, and institutional and network dynamics. A similar stance must be taken towards institutions, or, indeed, any cognitive network. In doing so, however, the mistake of slipping into a solipsistic relativism must be avoided, for that goes too far, and becomes its own form of inauthenticity.
8. Even though the macroethics of complex adaptive systems are beyond the level of the individual, authenticity requires that each individual, operating in good faith, participate in establishing institutional capabilities to dialog with such systems, be they technological, environmental, biological, cultural, or social.
9. As a reflection of the increasing human role in, and responsibility for, integrated human/built/natural earth systems, authenticity requires thoughtful rejection of ideologies and frameworks characteristic of the first Enlightenment, and active movement toward reinvention of the Enlightenment for a profoundly multicultural, and much more complex, world. Thoughtful, for out of the first Enlightenment must be created a second that embodies the best elements of the first while enabling responses to new conditions, but there must also be rejection of those elements which now constitute cultural or temporal imperialism, or are too simplistic for the systems that characterize the Anthropocene.
10. Finally, authenticity requires understanding that the individual is a contingent framework that has worked well in the past, but is increasingly dysfunctional in a complex world characterized by cognitive networks extending across technological, biological, and human systems, and the evolution of transhuman variants, already well underway. Thus, authenticity demands

acceptance of cognition as increasingly involving production of emergent systems characteristics at levels higher than the individual.

11. This authenticity does not reject theology, but redistributes domains between the theological and the human in ways that culturally may be very difficult for many individuals to accept. The strength to accept such shifts, while at the same time not succumbing to mere relativism, is an important element of the authenticity required.

With knowledge of the anthropogenic Earth comes an existential crisis as the honest perception demanded by authenticity reveals a chaotic, unpredictable, highly problematic planet in the throes of anthropogenic change, with a complexity that neither existing intellectual tools nor language itself is adequate to address. Each individual is profoundly ignorant, and strives hard to remain ignorant even of their ignorance; naiveté and willful perceptual and intellectual blindness become comfortable characteristics of discourse. And the result is a fleeing into ideology, random myths, and stories, the creation of mental models that simplify reality into manageable fantasy, and reduce perception until it no longer threatens. This is understandable, but it is cowardice; it is bad faith; it is profoundly inauthentic. It is a flight from freedom, from responsibility, from integrity. As Sartre said in the context of the individual, “Man is condemned to be free.” And this is a far more daunting challenge in the context of an anthropogenic world that, having created, we now want to pretend not to see. For now this freedom, from whence rises moral obligation, is neither comfortable, nor, sometimes, even bearable. But it is the freedom demanded by the historical moment, and it is non-delegable.

> “He, only, merits freedom and existence
> Who wins them every day anew.”