

**Hope Springs Exponential:
The Figure of the Exponential in North America**

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Hope springs eternal in the human breast; Man never Is, but always to be blest; The soul,
uneasy and confin'd from home, Rests and expatiates in a life to come.

These lines were written by Alexander Pope in *An Essay on Man* in 1734. They evoke the separation of humankind from the source of its comfort. The soul—the seat of reason and morality—is “uneasy and confin'd from home.” In its alienation from a true, blessed existence, it orients itself towards what is to come, another life or the future. For Pope, human life is lived in anticipation of a different kind of existence in the future.

In 2009 during the first phase of my dissertation fieldwork¹, I came across an image that a Toronto-based transhumanist activist had painted, which he had posted on his blog. Transhumanism is a social and philosophical movement which has become increasingly prominent in the United States and western Europe over the past twenty years. It advocates the development and use of technologies for making human beings “better than well”—smarter, healthier, stronger, faster, and more capable in any way that transhumanists care to imagine. I had spoken with this man several times in the past: he was once the head of the Toronto Transhumanist Association, and been invited to speak at several international transhumanist events. He was also an active presence online, blogging on his personal page and for major web outlets about new technologies and their effects on human society.

His painting, entitled “Singularity,” is also about hope. It depicts a curve originating precisely at the bottom left corner of the canvas. The curve rises slowly across the lower half, before reaching an inflection point and taking off on an accelerating trajectory towards an object that looks like the sun.

¹ Earlier versions of this paper have been presented at the 2nd Ethnography of Science and Technology Workshop at the Graduate School of Human Sciences, Osaka University, in 2011, and at the “On Speculation: Fiction, Finance, and Futurity” seminar at the 2012 Cultural Studies Association meeting. I am grateful to comments from Aimee Bahng, Gergely Mohacsi, Atsuro Morita, and the other participants of these workshops.

Shades of blue, which gradually darken from bottom to top, evoke the escape from the earth's atmosphere when the hues of the sky give way to the darkness of an infinite space. The area under the curve is dark red and organic, the color of flesh and blood. These areas converge at the upper limit of the canvas, where they are both consumed by the source of illumination. Like Pope's words, this painting implies an anticipation for the future, but it emphasizes the contour of the path that humanity will take towards it. In its colorful gradations and burst of blinding light, it shares Pope's hope for "a life to come," albeit with a contemporary flavor. The transition from fleshy present to blinding future inscribed on the painting is a visual representation of the exponential curve, a figure which is prevalent across the transhumanist movement.

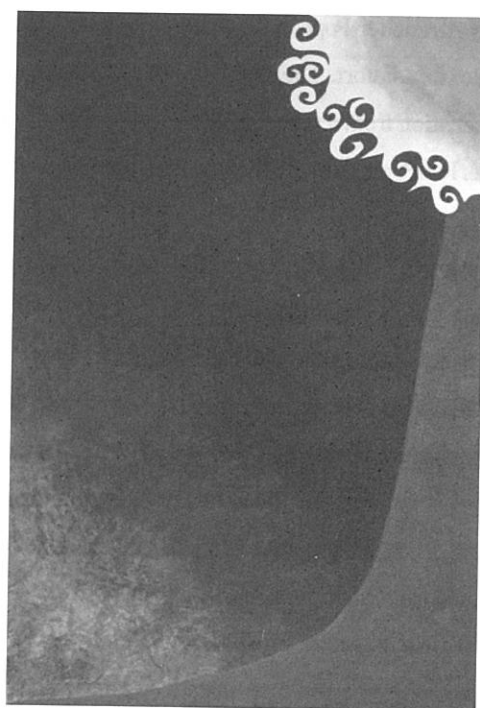


Figure 1. "Singularity"

What does the figure of the exponential do? How does it push people to imagine and act in anticipation of a hopeful future? In spite of the spread of transhumanist ideas across North America, it has only been examined by anthropologists and other scholars to a limited degree. Less an object of empirical examination, critical scholars have instead tended to look at it as a competing academic discourse about the changing forms of the human subject in technological societies (Bostrom 2005a, 2005b; Tirosh-Samuelson 2008; Hayles 2008; Haraway 2006; Fukuyama 2002, 2004; Sharon 2014; however, see Farman

2013). Such approaches provide critical insights into the conceptual and ideological dimensions of transhumanist ideas. However, they leave out accounts of the practices through which these ideas become compelling to their adherents. Without knowing *what* transhumanists do, any rendering of transhumanism will overemphasize how knowledge shapes action, rather than show the multiple interactions through which knowledge and action are both generated.

In contrast, my aim in this paper will be to apprehend transhumanism not as a movement or school of thought, but ethnographically as a network of knowledges and practices mediated by the figure of *the exponential*. I borrow the notion of the figure from Donna Haraway, for whom figures "are not representations or didactic illustrations, but rather material-semiotic nodes or knots in which diverse bodies and meanings coshape one another." (2008, 4). The exponential curve as depicted in the painting "Singularity" is then one graphical embodiment knotted to the figure I am calling the exponential. To take the exponential as a figure will show transhumanists not just as a group of people who share hopeful predictions of the future and act in accordance with them, but as nodes within a material-semiotic network that links them to many representations and practices related to the future.

Methodological Issues

My focus on the exponential as a figure is motivated by challenges that I encountered during my fieldwork in North America. From the spring of 2009 until the summer of 2011, I sought to pin down sites and key informants with whom I could perform participant observation, and arrive at classically "thick" descriptions of transhumanist lifeways (Geertz 1973). I attended several transhumanist conferences held in New York City, Detroit, and Cambridge, Massachusetts, as well as smaller, more frequent meetings near my home base of Toronto. I monitored mailing lists, blogs, and social networks, corresponded with self-identified transhumanists around the world, and slowly widened my scope to include interviews with people involved in local "hackerspace," "Quantified Self," and atheist communities.

I was learning many things from many people, but it quickly became clear that if my aim was to do classical "single-sited" ethnography, there would be no obvious place for me to go. People who come to identify as transhumanists often first encounter the ideas through web pages, books, or films. In large population centers, such as Toronto, New York City, or the Bay Area of California, there are regular meetings of transhumanist groups, but most of their mutual interactions take place through e-mail lists

and social networks. The large conferences, such as the Humanity+ meetings I attended at Harvard University and the Parsons School of Design, or the annual Singularity Summits held in large American cities, are moments when the core parts of the community come together, but these are often only accessible to the more affluent and centrally located adherents. Rather than the villages, communities, or neighborhoods where anthropologists have traditionally worked, I was faced with a unlocalized group that was held together not by geographic proximity or other shared material conditions (cf. Gupta and Ferguson 1997), but by a common interest in social and technological problems and the future of humanity. In this respect, it is understandable that cultural analysts, including anthropologists, have tended to treat some transhumanists as colleagues rather than research subjects: their forms of organization more closely resemble those of academics than the archetypal “natives” of classic ethnography.

But it also became apparent that transhumanism could not be apprehended just as a group with a shared identity or philosophy. For instance, some members of the main transhumanist group in Toronto also belong to the Center for Inquiry, an atheism activist group, but many transhumanists, such as philosopher James Hughes, argue for the compatibility of transhumanism with Buddhism. Many transhumanists are active members of the Toronto cryonics community, which I will discuss below, but other transhumanists prefer options such as preservation through plastination. Moreover, not all transhumanists participate in outwardly transhumanist groups or are satisfied identifying themselves as transhumanists. For instance, members of a hackerspace in Toronto are extremely well versed in transhumanist texts and ideas, and consider themselves to be transhumanists, but are active at the hackerspace or in the local Quantified Self group—most members of which are not transhumanists—instead of the main transhumanist organization. Still others, who share ostensibly “transhumanist” ideas about humanity reject the label of “transhumanist,” instead asserting a vanguard identity that exists outside of any organized doctrine, a reflection of the ideological overlap of some areas of transhumanism with individualistic libertarianism. Thus, rather than a coherent set of beliefs, practices, or social characteristics, what I had initially approached as a transhumanist movement or community began to come into relief as a network of linked actors whose borders and extent may not clearly be defined.

Such methodological challenges have been at the center of much contemporary anthropology, particularly in what is known as multi-sited ethnography (Marcus 1995). The approach was popularized by George Marcus who argued that anthropologists had to recognize the embeddedness of their field sites within “an historic and contemporary world system of capitalist political economy” (1995, 95-96),

which challenges the adequacy of studies of single, bounded sites for understanding the lifeways of contemporary anthropological interlocutors. Regardless of where they may be situated, none of the subjects of anthropology are isolated in a way that warrants uncritical reliance on single-sited research (Appadurai 1996; Metcalf 2001). This situation requires research practices that “quite literally [follow] connections, associations, and putative relations” (Marcus 1995, 97). An exemplar in this ethnographic genre is Emily Martin’s *Flexible Bodies* (1994). Martin follows the emergence of the notion of a “flexible” body and immune system through its manifestations in the history of biology and immunology, media representations of the immune system in American popular culture, and interviews in an array of diverse urban communities. Martin’s aim is to track how certain conceptions of the immune system have emerged and play out in often unexpected ways across many domains of American life. Transhumanism seemed also to have a similar distributed and uneven existence. A multi-sited approach seemed appropriate, but this left the challenge of identifying precisely what it was that I was to follow in mapping out my ethnographic object. If not an identity, an ideology, or a set of practices, then what was I mapping? Was it “flexibility,” as it was for Martin, or another pervasive figure? With such concerns in my mind, I resolved to focus my efforts on a group with whom I could most frequently and closely interact, cryonicists in Toronto.

Freezing in Toronto

To be a cryonicist means that you want to have your body preserved in liquid nitrogen after your death has been legally declared. Cryonicists typically purchase memberships and services from a cryonics service provider which will accept the bodies of the recently deceased or “de-animated.” The provider removes blood and injects a cocktail of chemical protectants into the body to prevent the formation of damaging ice crystals, prior to transferring the body to a large tank known as a “dewar” filled with liquid nitrogen. There, the body will be kept at low temperatures until the technology to safely defrost, repair, and “re-animate” the person is developed. The procedure costs up to \$100,000, which varies depending on the particular service provider, and on how much of the body is preserved. A “neuro”—the preservation of just the head—is about one-tenth the cost of a full body preservation, and many cryonicists see this as an acceptable and more affordable option, given their conviction that all that makes up their “selves” exist as patterns in the brain. Services are also available for beloved pets.

In North America, there are two main providers of cryonic preservation services. One is a company called Alcor, located in Scottsdale, Arizona. The other is the Cryonics Institute in the township of Clinton,

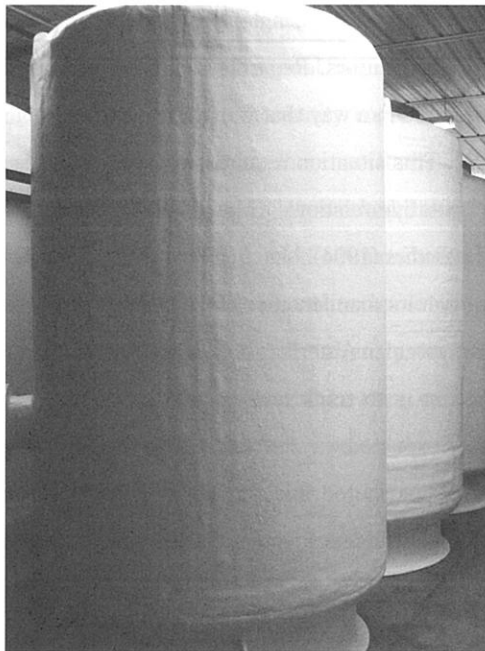


Figure 2. Dewars containing bodies of patients suspended in liquid nitrogen at the Cryonics Institute in Michigan.

just outside of Detroit in Michigan. According to many cryonicists, Alcor is the larger and more stable of the two service providers, but many in Toronto sign agreements with the Cryonics Institute because it is only a three-hour drive away from urban Toronto, compared to the long flight to Arizona. When one has died, it is imperative that the body be preserved as quickly as possible, and the delays of transporting a corpse, or “patient” as the cryonicists call them, on an international flight make Alcor an untenable choice.

Human preservations are often funded by life insurance policies purchased by the ‘patient’ which name the cryonics service provider as a beneficiary. As the word ‘patient’ suggests, cryonicists view cryonic preservation as a form of medical treatment. It is to be used when all other currently available treatment options have been exhausted, so that the patient might be able to benefit from treatments that have yet to be developed. As such, it is not viewed as freezing after death, but as a pause button pushed just prior to actual death.

Cryonics is a sub-category within the broader movement of transhumanism. To preserve oneself in a frozen state only makes sense if there is the possibility of reanimation in the future, and reanimation will

only be possible if technology can progress to the point where the damage caused by illness, aging, death, and preservation can be repaired and reversed. While frozen, cryonicists expect that nanomachines, artificial organs, or technologies for uploading one’s consciousness into a computer will develop, making it possible for them to live again in a new form. According to one informant, one cannot be a cryonicist without being a transhumanist. If one does not believe that future technologies can revive a frozen person, then there is no point to being frozen.

Each January, cryonicists in the Toronto area gather to celebrate Bedford Day, one of two major gatherings for the community each year. The day is named for James Bedford, a psychology professor who was the first person to be cryonically preserved after he passed away in 1967. Near the beginning of my fieldwork in 2010, I attended my first Bedford Day party, held at the home of one of the members of the local cryonics organization. Toronto is frigid in January. Knee high walls of crusty snow line the edges of sidewalks. Over the course of the winter, these walls grow thicker, higher, and dirtier as large plows push snow from the streets outwards to clear the way for cars. Homeowners push the snow back to make the sidewalk safe for pedestrians, raising the wall even higher. This is to avoid fines given out by city authorities for failing to maintain safe conditions in the neighborhood during the coldest time of the year. The neighborhood where the party was held is in a quiet residential area of Toronto, a few minutes by subway outside of the downtown core. Adjoined brick houses sit in long straight lines down the wide streets. Following the road away from the subway station, one must step carefully around mounds of snow and sheets of ice on the sidewalk.

The house where the parties are held belongs to a couple in their late thirties, who live with a few of their pets. Cryonicists tend to be largely but not exclusively male; the leader at the time was a female emergency room nurse. There are several heterosexual couples associated with the cryonics group in Toronto, but it is almost always the male partner who is signed up for cryonicists. In these couples, the female partner tends to be indifferent or only mildly interested in preservation. Cryonicists tend to be in their 40s or older, and often work in IT-related fields. This reflects interests that many of them have had in science and technology since childhood, fostered through science fiction and non-fiction books and films. A large proportion of the cryonics group there is made up of well-educated immigrants from developing countries or former communist states. This reflects the composition of Toronto’s population, more than half of which was born outside of Canada. As is common for many immigrants to Canada, they are educated but not able to easily secure specialized employment related to their training, and are often in mid-level technical occupations. For instance, one member holds a Ph.D. in a biology-related field, and

was a researcher in his home country, but in Toronto, he works in software technical support.

The cryonicists' gatherings are always casual. Some people will have come straight from work and driven an hour or more to make the party. When the doorbell rings, one of the guests will open the door, and greet the new arrival with a smile and a hug, and help find a place for their winter coats on the rising pile already occupying an armchair. Near the door is a pair of facing sofas, where a group of four or five will often sit to chat about what has happened to them over the past year, and members of the group who couldn't make it to the party. A favorite topic is news about new research on cancer or the beneficial effects of some chemical or nutrient which will promote long life or reverse aging. At my first Bedford Day Party, this area was taken up for a while by a man named Harold² signing the first set of documents for an agreement to be cryonically preserved by the Cryonics Institute. It was a happy occasion for those present, because it was another friend they would be able to see again in the future.

Further into the house is the dining area, dominated by a dark and solid wooden table of a size which leaves only just enough room for people to squeeze through to the seats in the corner. Potato chips, cake, cookies, and bottles of wine and soda are all open and enjoyed by the changing membership of that room. Some stay longer than others to refill and empty their small paper plates several times, while others linger for just a moment, before deciding that they will wait for the ice cream, which one of the members always brings.

Though Christmas and the other mainstream celebrations of the season have all passed by, there remains something festive about a gathering in the middle of winter. Harold, who I would come to know well said to me, "Merry Christmas, if you celebrate it." An immigrant from a former European communist country, he explained to me how it once was illegal to celebrate Christmas there when he was young. An atheist now, he did not celebrate the occasion himself, but he seemed happy to be able to wish a Merry Christmas to others.

That first party, I also met Joseph, an older postal worker standing next to the table, looking less interested in the refreshments than the attention of the people near him. He wore a well-used red sweater, softened by age but not frayed. His hair was white, and wrinkles traced the lines of his smile as

² The names of the Toronto organization members have been changed to pseudonyms. I express my thanks to them for their help during my research.

he turned to me and another newcomer. "Cryonics is 'Plan B'," he declared. Plan A was not to die in the first place. Unfortunately, people of his age, he said, would probably not live to see the development of technologies that would repair the damage to the body caused by aging.

He addressed those around him about what was coming in the near future, his face warm, and eyes bright with hope and enthusiasm. He said that in the future, nanotechnology would produce microscopic machines capable of entering individual cells in the body and repairing damage caused by disease, or the process of aging, which he also sees as a disease. Energy shortages, he continued, would be a thing of the past as new sources of power were developed. We are now living longer than we have ever lived in human history, he told us, and this is only going to improve. Just last week, he said, there had been news reports about a new genetic treatment for cancer, which has the potential to lead to effective treatments for some forms in the near future. Others chimed in, adding information about other recent developments across an array of different sciences, which they tracked primarily through blogs and mailing lists. These sources were important to them for their immediacy. Though little of this news would materially affect their lives right away, it was essential that they know what was becoming possible and available. Listening to this discussion, I learned about a future in which our current computers, energy sources, medicines, surgeries, and bodies would eventually be replaced with better models. Versions 3.0 of everything. Finally, Joseph turned to me, and said, "You will probably live long enough so you never have to die. Technology is growing exponentially."

The Exponential

For transhumanists, like Joseph and the man who painted "Singularity," exponential growth is an ineluctable force that is pushing humanity to the future to a point in the future when "humans [will] transcend biology" (Kurzweil 2005). That moment, when exponential growth in technology overtakes the limits of the human brain and body, is known as the Singularity. The Singularity idea was popularized by Ray Kurzweil, an inventor and futurist famous for inventing optical character recognition systems as well as electronic musical instruments. In 2012, he was personally hired by Google co-founder Larry Page to develop language-related technologies, but in the two decades before then he produced a series of best-selling books and films that outline his vision of the future evolution of humanity. Kurzweil has become one of the main public figures associated with transhumanism.

According to Kurzweil "the pace of change of our human created-technology is accelerating and its

powers are expanding at an exponential pace.” (2005, 16). In books such as 2005’s *The Singularity is Near*, Kurzweil discusses an immense range of technological processes, and “evolutionary processes in general” including social and natural change, and discusses how they each fit what he calls the “Law of Accelerating Returns.” The essence of this law lies in his observation that each stage of an evolutionary process improves upon the methods employed by the previous one, resulting in higher “returns” produced at each stage. At the center of any evolutionary process is a cycle of positive feedback, each loop returning greater returns for lower cost, thus increasing the rate of change and improvement in the process.

Kurzweil views these “returns” as being of many types. The “return” of natural evolution is better survivability. The “return” of semiconductor development is cheaper processing power. The “return” on genetics research is faster and cheaper genome sequencing ability. Ultimately, however, all forms of “return” are increases in the “order” or “intelligence” of the universe. Humans are currently a highly evolved embodiment of intelligence, but just as single-celled life forms evolved into mammals, and mammals evolved into humans, humans will evolve into the posthuman.

What will facilitate the evolution of humans into the posthuman is technology. Kurzweil observes the plummeting cost of computer processing power over the past decades and sees signs that a machine with human-level intelligence is an inevitability. Once a machine is able to improve its own design, then the pace of progress will accelerate, propelling technology and humanity towards a moment when it will fuse into a new and more advanced form of intelligence. This is the point that Kurzweil has dubbed the “Singularity,” which he predicts will occur by the end of the 2020s. The Singularity is the inflection point in the exponential curve, when humans will merge with technology, giving rise to a new “posthuman” mode of existence free from the biological constraints on intelligence. This posthuman will be able to create, explore, and evolve without limit. At the outer edges of Kurzweil’s prognostications, human intelligence will progress to the point where it becomes a force “more powerful than physics,” reshaping the entire universe into an intelligent computer (Kurzweil 2005, 364). It is upon a wave of exponential growth that humankind will find itself delivered into this future, and it is this path that the transhumanist painting I mentioned at the outset depicts on canvas.

Kurzweil’s predictions have met with skepticism from many circles. Among scholars of technology and culture, Kurzweil and the Singularity idea are criticized for unreflexively promulgating undesirable ideologies under the guise of technological inevitability. Philosopher N. Katherine Hayles, for instance, sees in transhumanism an orientation towards the world that takes the ultimate form of human happiness to be utter freedom of the individual from its bodily bonds, a conservative revision of the atomistic

individual of classical Western liberalism (Hayles 1999; 2008). Donna Haraway, while claimed by some transhumanists as a pioneer in the movement for declaring “I would rather be a cyborg than a goddess” (1991, 181), takes transhumanism as the latest chapter in a history in which social elites empower themselves with technology (see Haraway 2006.)

The content of Kurzweil’s prediction is of less importance than the symbolic means he uses to diffuse it. His emphasis on acceleration and exponential growth resonate with more broadly salient discourses about the state of high technology and its future growth, specifically, Moore’s Law. Moore’s Law is the now famous observation made by Intel co-founder Gordon Moore in 1965. Moore had observed that the number of transistors on an integrated circuit was doubling every 18 months, and predicted that this would continue. On one hand, statements like Moore’s Law are legible as empirical claims, predictions of the future based on data known in the present. It is, in fact, true that the density of transistors on integrated circuits has been growing approximately in line with Moore’s observation, up until the present day. On the other hand, Moore’s Law is stated as a law, because it seems, in some way, to have the force of nature behind it. Sociologist Donald Mackenzie has written that Moore’s Law, while often taken to describe the ‘natural trajectory’ of technology, should actually be seen as self-fulfilling belief, which has guided technological and investment decisions. (MacKenzie 1996, 8, 57) The interpretation of Moore’s Law as a prediction of the future has itself resulted in semiconductor companies creating future development roadmaps according to it.

The law has played a significant role in making the future that it anticipated, becoming embedded in the discourse of technology so deeply that the possible end of Moore’s Law is seen as a crisis. Flipping the older Malthusian fear of collapse due to exponential population growth, physicist and public intellectual Michio Kaku has flagged the possible end of the exponential growth of technology as the impending crisis of our times. In 2011, Kaku wrote in *Salon*, “[T]he collapse of Moore’s law is a matter of international importance, with trillions of dollars at stake. But precisely how it will end, and what will replace it, depends on the laws of physics. The answers to these physics questions will eventually rock the economic structure of capitalism.” (Kaku 2011) While Kurzweil and Kaku differ in their optimism about the continuation of exponential growth, they both position it as a force of global economic and social significance that is rooted in the universal realm of physics and nature.

Kurzweil’s use of the exponential is grounded in the lived experience that he, Kaku, and others in affluent North American society have had of Moore’s Law. Computers *have* gotten exponentially faster,

cheaper, and smaller; and this has led to tangible changes in their lived experiences. Kurzweil's Law of Accelerating Returns uses the figure of the exponential as an interface for linking these lived experiences with a claim about the order of the universe and the future direction of mankind. He achieves this by loosening its referential ties to a specific and concrete reality.

Kurzweil's Law of Accelerating Returns takes the exponential trend of Moore's Law, and shifts it into a natural law of even greater range than Mackenzie might have expected. Kurzweil's writing is notable for its breadth. It seems that no area of modern achievement has escaped his notice and analysis. But even more interesting is how in Kurzweil's hands, seemingly unrelated areas of human endeavor seem to become part of a grand cosmological movement towards human transcendence. Any process of change that can be fitted to an exponential growth curve seems ready to become part of this grand story. Kurzweil's text includes countless graphs of many different areas of technology and society, showing how they follow the same exponential rate of change. Predictably, there are graphs for Moore's Law, but there are many others charting the number of transistors per microprocessor, the cost of computer memory per bit, the cost of magnetic data storage per bit, change in the cost of RAM over time, microprocessor clock speed, microprocessor cost, the number of internet hosts, and processor performance. Beyond information technology, he includes graphs showing exponential change in areas as diverse as the resolution of non-invasive brain scanning, gross domestic product, per-capita GDP,

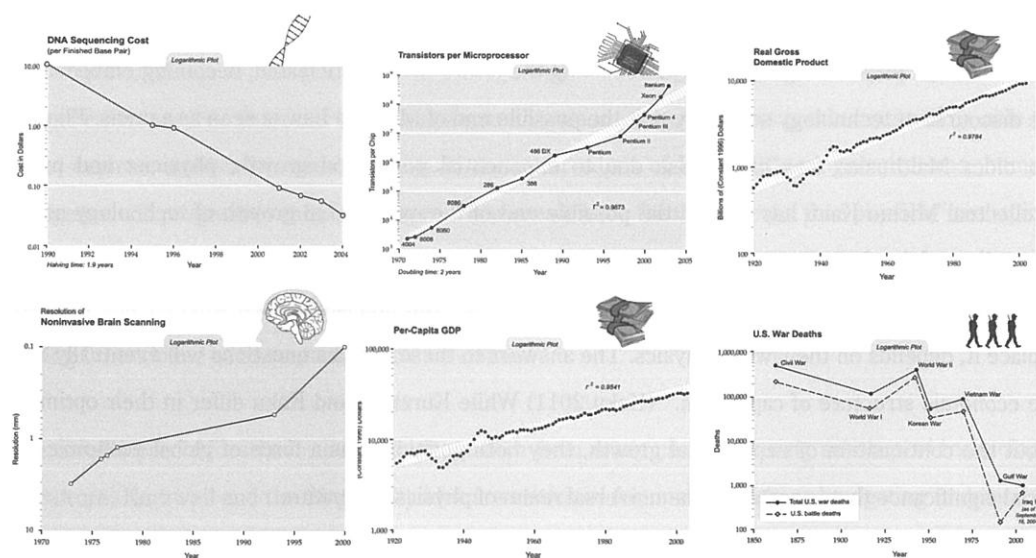


Figure 3. A selection of graphs from Kurzweil (2005). From top left: DNA sequencing cost; Transistors per microprocessor; Real gross domestic product; Resolution of noninvasive brain scanning; Per-capita GDP; U.S. war deaths. The graphs appear as lines, because the y-axis is a logarithmic scale.

private manufacturing output, and even U.S. war deaths.

The cumulative effect of these graphs is to nullify the material significance of any individual one. While any phenomenon adequately massaged might be made to fit an exponential growth curve, Kurzweil's tack is to abstract the exponential away from any single material exemplar, such as Moore's Law, and position it as a trope that signifies cosmological order in general. Mirroring the tremendous arrays of "returns" that he sees providing evidence for his Law of Accelerating Returns, these collected portions of the society become framed as instantiations of the exponential cosmic order. This is powerfully illustrated in a recent documentary on Kurzweil called *Transcendent Man*, which made its Canadian debut in 2010 at an ecological film festival in Toronto. In a climactic scene, the documentary shows a rumbling red bar flying through space with a flash and a bang, rising into the sky, towards a mysterious source of light, like the one at the end of the exponential curve in the "Singularity" painting. In an exponential curve, the rate of growth is growing, and in this section of the film, we are meant to experience acceleration, ever-increasing speed. Fast abrupt cuts, and the cells of an organism dividing in fast-forward. The world of our recent experience, consisting of cars, computers, and the internet, is given as much time on screen as the billions of years of evolution that preceded it. The film is showing us that what happens now in one year is equivalent to the progress that was once made in a thousand. It presents the history of the known universe in terms of a process of exponential growth, by pulling the figure itself into an abstract space, floating without any essential connection to the contingencies of the material world, except as the governing principle of order.

The Exponential as a Cosmological Axiom

In this respect, the exponential is a figure in the Harawayan vein, but it is one that has characteristics of what the anthropologist of religion Roy Rappaport (1999) called a *cosmological axiom*. Cosmological axioms are statements about the nature of the universe that provide an epistemological foundation for religious social orders. They are broad claims about the ontology of the universe that exist within a hierarchy of statements that increase in the specificity of their material referents as they decrease in their "sanctity." Sacred statements provide the principles of order; mundane statements give the details of its manifestations. Thus, more sacred statements, such as cosmological axioms, make weaker reference to the immediate and concrete experiences of their adherents, but provide a basis for trust in their perceptions and interpretations of those statements. "Lower-order" statements are "sanctified" by cosmological axioms, giving them meaning within the overall order, but they also have more immediate

material referents, which make their truth easier for adherents of an order to empirically establish. Through various ritual practices, these material referents and their links to lower-order statements are reconfirmed, and the sanctity of higher-order statements such as cosmological axioms is stabilized.

As discussed in relation to Kurzweil's diverse application of his Law of Accelerating Returns, and the filmic representation of the exponential in *Transcendent Man*, the exponential has been disarticulated from its material origins in Moore's Law, and elevated to a cosmological axiom: stripped of its material referents, it becomes a symbol of the true nature of the cosmos. Then, for Kurzweil, the exponential becomes a way to establish the truth of various trends that he can be observed across society, regardless of their material basis. The exponential growth forecast by the Law of Accelerating Returns is not true because it has been empirically proven; rather it is the source of truth, and warrants his perceptions of the world.

Similarly, for Joseph and the other cryonicists, the sense that technology is growing exponentially guarantees their conviction that new scientific discoveries are predecessors to the radical future treatments that will allow them to avoid death or to recover from it. And, as implied by *Transcendent Man*'s free-floating exponential curve, the possibility that any single discovery will fail to lead to effective treatments for death does not invalid their faith in exponential growth in general: the exponential's lack of material reference permits such "predictable uncertainty" (Adams et al. 2009, 247).

However, their conviction finds material grounding in their immediate experiences of technology, which serve as tangible instantiations of an underlying, exponentially accelerating cosmic order. Joseph, for instance, interpreted his future cryonic preservation and re-animation as a form of "time travel," in which he would slip from the moment of his death into the distant future in an instant, from his perspective. However, this time travel would not be the first for him in his life. In his experiences in a communist state and after emigrating to Canada, he had already travelled in time to a better future. In an interview, he told me, "We have seen in our lifetime... we have seen things which we could never dream about, right? The first thing which I could never dream about was the fall of communism... It happened! Then, it was the computer." In 1977, he had first read about computers in a book of Russian math puzzles. "My dream was to see a real computer," he told me, "and God forbid to touch one." In 1985, as a university student, he performed this "unimaginable feat" when he was able to use an old Chinese mainframe that had been kept secret in his country for many years. When he eventually departed for Canada, he began a life in which a computer many hundreds of times more powerful was on his desk for

him to use every day. These experiences had placed even things that were beyond what he thought was possible into the realm of what he might be able to personally experience: "So, many things which I couldn't imagine have happened. So, why not [cryonic] life extension? Why not interstellar travel? Why not Mars terraforming and colonization?"

Gatherings such as the cryonicists' Bedford Day party then become legible to us as forms of ritual, which serve to reconfirm the sanctity of the exponential through immediate and concrete practices. Ritual, in Rappaport's rendering, goes beyond what are conventionally considered religious rituals to "denote the performance of more or less invariant acts and utterances not entirely encoded by the performers," (1999, 48).³ The annual Bedford Day parties mark the passage of time, reconfirm the group members' relationships with each other and their collective interest in cryonic preservation, not unlike the more conventional Christmas celebrations that Joseph acknowledged to me. In this respect the order of the party is "not entirely encoded by the performers." Moreover, the party provides a venue for performances such as Harold's, in which testimony about the continued progress of technology is heard by the group.

The ritualistic aspects of the cryonicists' other major annual gathering are even more apparent. Each year during the summer, the group gathers to unpack their "stand-by kit," a collection of equipment that they will use if any one of them should suddenly die. It consists of a steel gurney upon which to place the body of the patient, various plastic sheets to hold the patient and the ice water in which he or she will be packed, and a "thumper," a device powered by a pressurized air tank that will rhythmically push the patient's chest to keep the fluids in their body in circulation until preserving chemicals can be administered. At the summer stand-by kit training sessions, they gather to assemble the various parts and test them out. In place of a patient, they place a basketball underneath the thumper, to ensure that it will work when needed. While limited by the group's limited resources, they strive to follow certain after-death procedures specified by the Cryonics Institute and other providers. The stand-by kit is stored in one of the members' homes, so they also use the opportunity to confirm which members have

3 Subsequently, other anthropologists have generalized Rappaport's notion of ritual further to include ordinary speech acts (Lambek 2008). In its general outlines, the approach is similar to Erving Goffman's analysis of greetings (1956), and Gregory Bateson's cybernetic analysis of communicative acts in general (Bateson and Ruesch 1951), as well as more recent analyses of material-semiotic "enactment" (Mol 2002), and Latour's discussion of how "interested groups are kept in line" by integrated them into a "black box" that functions predictably and repeatedly as a single whole (Latour 1987, 131). Though I rely on Rappaport's terminology here, my arguments about the repetitive and formalized practices of cryonicists may also be rephrased in terms of practices that reinforce the effectiveness and action of Harawayian material-semiotic nodes.



Figure 4. Cryonicists assembling their "stand-by" kit.

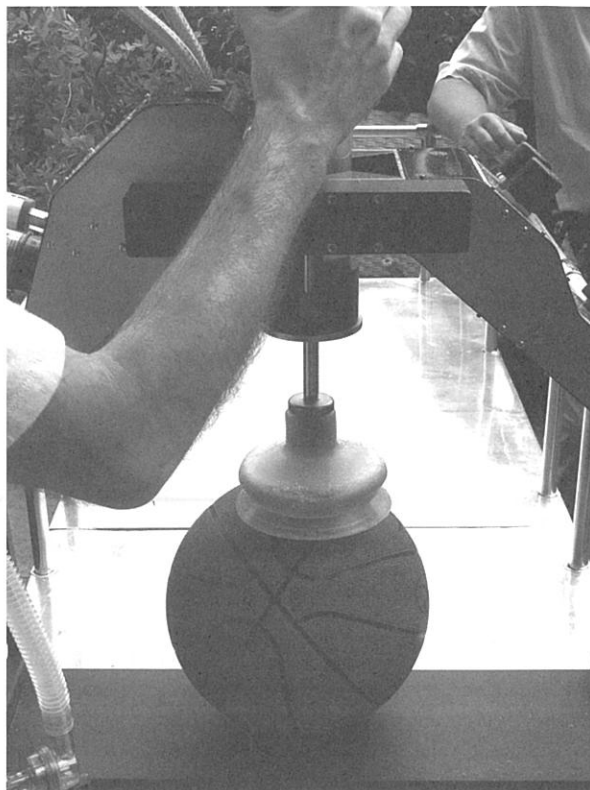


Figure 5. Cryonicists testing their "thumper" with a basketball.

keys to access the kit if the owner of the house is not available. Once the stand-by kit's readiness has been confirmed, the members disassemble the parts and place it back in its storage place in the garage, before sitting down for refreshments in the backyard.

These gatherings are the most prominent ones for the local Toronto group, but other regular events of both smaller and larger scale are equally important as rituals. At the larger scale are those international gatherings, such as the Singularity Summits or the Humanity+ conferences mentioned above, which attract large audiences in major cities, but also significant viewers online through social media. Every autumn, the Cryonics Institute in Michigan, which many of the Toronto group have contracted to preserve their bodies, holds an annual general meeting where they can get updates about recently preserved patients, hear reports about the organization's finances, and learn about their future plans. It is an opportunity for cryonicists located in nearby areas of the US and Canada to see each other; and family members of some of the people preserved at the Cryonics Institute take the opportunity to lay flowers next to the large tanks containing their loved ones. One cryonicist from Toronto I attended a meeting with showed me the tank where his beloved cat was preserved, and pointed out the entry in the tank's log book showing her name. At smaller scales, the Toronto group also performs other, more frequent activities. Because a successful cryonic preservation requires the cooling process to begin as close to the moment of legal death as possible, the Toronto cryonicists contact each other using the phone in a calling circle. They assign one person to call another every few days. If the call is not answered, they will begin investigating that person's whereabouts to make sure that if he or she has died and not been discovered, the body is not allowed to decompose for very long. They hold meetings one evening a month at a downtown Toronto restaurant and keep in regular contact on an e-mail list for the same purpose.

Conclusion

Such practices, from the weekly phone calls to the monthly gatherings and the annual meetings and conferences, gain meaning through their connection with the figure of the exponential. Conversely, the exponential, through its manifestation in various discursive and material forms, including the rituals of the cryonicists but also Kurzweil's claims about the Singularity and the Law of Accelerating Returns, is reinforced as a node along which concrete and immediately sensible practices of the cryonicists connect with the grander, cosmological claims about the exponential progress of human society, technology, and the universe itself. The exponential is the figure that holds these representations and practices together,

placing earthly activities within a cosmic order and giving that cosmic order many earthly manifestations.

At the level of research method, the exponential emerged as the key actor for “locating” (Ferguson and Gupta 1997) an ensemble of cultural phenomena that did not easily fit within the more conventional tropes of the “site” or the “field.” Instead, the figure of the exponential became the center of an inquiry that followed chains of association to the more grounded and localized activities of the cryonicists, and filled out a picture of “transhumanism” textured by connections through which different acts and actors conjure and reinforce their forms and meanings in relation to one another.

Finally, though I have limited my inquiry in this paper to the connections between the figure of the exponential and the everyday lives of a group of cryonicists, the connections that I have left unexplored hint at the broader salience of the exponential in contemporary North American society. The “end of Moore’s Law,” for example, continues to be confronted as a technological and economic crisis awaiting us in the near future, suggesting that the figure of the exponential is integral to more widely held ideas about the nature of progress and the possibilities of the future. Exponentially-inflected thinking is also undoubtedly at the basis of the private graduate school known as Singularity University, which counts Kurzweil as well as Peter Diamandis of the X-Prize Foundation among its founders and advisors. It is also an institution supported by major corporate and academic players such as Google, Cisco Systems, Deloitte, and the University of Georgia. How, then, might the seemingly localized and admittedly fringe practices of cryonicists articulate with the activities of Silicon Valley’s technological and financial elites? In what ways might the future-oriented ideas and practices of cryonicists shed light on the workings of speculative finance or on-going transformations of information societies? Such questions might be made tractable to ethnographic investigation by following figures such as the exponential, as they join, mediate, and translate among the elements that give order to contemporary life in North America, and in turn, given us a line of sight into how people experience life and hope as they experience endless acceleration towards the future.

References Cited

- Adams, Vincanne, Michelle Murphy, and Adele E Clarke. 2009. Anticipation: Technoscience, life, affect, temporality. *Subjectivity*, no. 28:246-265.
- Appadurai, Arjun. 1996. *Modernity at Large: Cultural Dimensions of Globalization*. Minneapolis and London: University of Minnesota Press.
- Bateson, Gregory and Jurgen Ruesch. 1951. *Communication: The Social Matrix of Psychiatry*. New York: W.W. Norton & Company.

- Bostrom, Nick. 2005a. A history of transhumanist thought. *Journal of Evolution and Technology* 14 (1). <http://jetpress.org/volume14/bostrom.pdf> (accessed February 18, 2010).
- . 2005b. Transhumanist values. *Journal of Philosophical Research* 30:3-14. <http://www.nickbostrom.com/ethics/values.html> (accessed September 10, 2009).
- Farman, Abou. 2013. Speculative Matter: Secular bodies, minds, and persons. *Cultural Anthropology* 28 (4): 737-759.
- Fukuyama, Francis. 2002. *Our Posthuman Future: Consequences of the Biotechnology Revolution*. New York: Farrar, Strauss and Giroux.
- . 2004. Transhumanism. *Foreign Policy*, no. 144:42-43.
- Geertz, C. 1973. *The Interpretation of Cultures: Selected Essays*. Basic Books.
- Goffman, Erving. 1956. The nature of deference and demeanor. *American Anthropologist* 58 (3): 473-502.
- Gupta, Akhil and James Ferguson. 1997. Discipline and practice: “The field” as site, method, and location in anthropology. In *Anthropological Locations: Boundaries and Grounds of a Field Science*. Ed. Akhil Gupta and James Ferguson. Berkeley, Los Angeles, London: University of California Press.
- Haraway, Donna J. 1991. A cyborg manifesto: Science, technology, and socialist-feminism in the late twentieth century. In *Simians, Cyborgs, and Women: The Reinvention of Nature*. New York: Routledge.
- . 2006. When we have never been human, what is to be done?: Interview with Donna Haraway. By Nicholas Gane. *Theory, Culture & Society* 23 (7-8): 135-158.
- . 2008. *When Species Meet*. Minneapolis and London: University of Minnesota Press.
- Hayles, N K. 1999. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. University Of Chicago Press.
- . 2008. Wrestling with transhumanism. *Global Spiral* 9 (3). <http://metanexus.net/magazine/tabid/68/id/10543/Default.aspx> (accessed June 15, 2009).
- Kaku, Michio. What happens when computers stop shrinking?. http://www.salon.com/2011/03/19/moores_law_ends_excerpt/ (accessed October 26, 2011).
- Kurzweil, Ray. 2005. *The Singularity Is Near: When Humans Transcend Biology*. London: Viking.
- Lambek, Michael. 2008. Value and virtue. *Anthropological Theory* 8 (2): 133-157.
- Latour, Bruno. 1987. *Science in Action: How to Follow Scientists and Engineers Through Society*. Cambridge, Mass.: Harvard University Press.
- MacKenzie, Donald. 1996. *Knowing Machines: Essays on Technological Change*. Cambridge, Mass.: The MIT Press.
- Marcus, George E. 1995. Ethnography in/of the world system: The emergence of multi-sited ethnography.

Annual Review of Anthropology 1995 (24): 95-117.

Martin, Emily. 1994. *Flexible Bodies: The Role of Immunity in American Culture From the Days of Polio to the Age of AIDS*. Boston: Beacon Press.

Metcalf, Peter. 2001. Global "disjuncture" and the "sites" of anthropology. *Cultural Anthropology* 16 (2): 165-182.

Mol, Annemarie. 2002. *The Body Multiple: Ontology in Medical Practice*. Durham and London: Duke University Press.

Ptolemy, Barry. 2010. *Transcendent Man*.

Rappaport, Roy A. 1999. *Ritual and Religion in the Making of Humanity*. Cambridge: Cambridge University Press.

Sharon, Tamar. 2014. *Human Nature in an Age of Biotechnology: The Case for Mediated Posthumanism*. Dordrecht: Springer.

Tirosh-Samuelson, Hava. 2008. Engaging transhumanism: The meaning of being human. *The Global Spiral* 9 (3). <http://metanexus.net/Magazine/tabid/68/id/10547/Default.aspx> (accessed June 15, 2009).