

Hope Springs Exponential
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In *An Essay on Man*, Alexander Pope wrote the lines from which I draw the title for this talk.

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.

A Japanese translation I took from a website of quotes translates these lines in this way.

希望は人間の胸中の尽きせぬ泉だ。
人間は幸福ではない、
然し常に将来に幸福を期待する存在なのだ

These lines from Pope 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. Human life is lived in anticipation of a different kind of existence. The ‘eternal’ of hope corresponds to the ‘eternal’ of the universe, and its fundamental immutability.

Two summers ago, I came across a photograph of a painting that a Toronto-based transhumanist activist had placed on his blog. Entitled “Singularity”, the painting is also about hope, but it evokes a sense of growth and change, rather than immutability. It is an illustration of the exponential curve, a figure which has been prevalent across the domains I have explored in my multi-sited research. In this painting, the locus originates precisely at the bottom left corner, and rises slowly across the lower half of the canvas, before taking off towards what looks like the sun. 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, perhaps organic, the color of flesh and blood. These areas converge at the upper limit of the canvas, where they are both consumed by a source of illumination. This painting also evokes a sense of anticipation for the future, but it emphasizes the contour of the path that humanity will take towards it.

Drawing hints from the exponential curve depicted in this painting, I want to begin thinking about what human beings are imagined to be today in North America, particularly among members of the transhumanist movement. Transhumanism is a social and philosophical movement which has become increasingly prominent in the United States and western Europe over the past fifteen years. It advocates the development and use of technologies for making human be-

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ings smarter, healthier, stronger, faster, and otherwise ‘better’ than they are now. However, my focus in this talk will not be on transhumanism per se, but on the exponential as a particular figuration they use, which also has much broader circulation in North America. I will suggest that the figure of the exponential is a symbol mobilized to imagine new temporalities and imaginaries of humans, technology, and the relationship between them.

I will speak much about the ‘future’ in the abstract, particularly in relation to what my interlocutors hope and expect the world to become. Their visions of the world they see emerging are vivid and intriguing in their own right, but the point of my exercise here is to think about what this future looks like embodied in the discourses and practices of the present. Writing about utopian literature, Fredric Jameson said that “[utopian texts] have for the most part rigorously restricted their textual production to [...] the construction of material mechanisms that would alone enable freedom to come into existence all around them. The mechanism itself has nothing to do with freedom, except to release it; it exists to neutralize what block freedom, such as matter, labor, and the requirements of their accompanying human social machinery.” (Jameson 2000, 385) The work of utopias, Jameson suggests, is not primarily in rendering a plausible ideal world, but in specifying the mechanisms that will push humanity toward it, because to imagine utopia from the present is to contaminate that utopia with the very imperfections in the present one wishes to eliminate. Therefore, the writing of utopian texts must primarily be about how humanity will traverse the terrain that lies between the here-and-now and the almost-there.

In what follows, I want to analyze how this terrain is mapped and how my interlocutors plan their journeys across it, by making sense of the figure of the exponential. As this painting suggests the exponential curve is not imagined as just the bare graphic depiction of an empirical trend. As I will argue, it is an icon, deployed for mediating relationships between humans and technologies, and presents and futures. The relationships it symbolizes are ones of *anticipation*.

Anticipation has been proposed by Vincanne Adams, Michelle Murphy, and Adele Clarke (2009) as a way of making sense of the associations between speculative modes of knowledge production, affective states in particularly situated contemporary subjects and collectivities, and a moral economy. I introduce it only briefly here, but I will return to it at the end to connect it more closely to the material which I will present. Reading my particular examples through anticipation, I want to show that the exponential curve and the idea of exponential change are central to how knowledge, temporality, and affect are experienced by transhumanists and others.

I would like to begin by telling a story about 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 your body soon after you have died, or ‘de-animated’. The provider removes blood and injects a cocktail of protectants into the body to prevent the formation of damaging ice crystals during the preservation process. The procedure costs up to \$100,000, which varies depending on how much of the body you want preserved, and which provider you choose. These 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. Cryonics only makes sense if there is the possibility of reanimation in the future, and reanimation is possible if technology can progress to the point where the damage caused by illness, aging, death, and preservation can be repaired and reversed. Cryonics requires anticipating the arrival of advanced technologies at some point in the future.

Cryonicists tend to be largely but not exclusively male. 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 cryonics. The female partner tends to be indifferent or only mildly interested. 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.

Though I believe this is particular to Toronto, a large proportion of the cryonics group there is made up of well-educated immigrants from developing countries or former communist states. 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 had performed research in his home country, but in Toronto, he works in software technical support.

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 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. These walls grow thicker, higher, and dirtier as large plows push snow from the streets outwards to clear the way for cars. Homeowners push snow back to make the sidewalk safe for pedestrians. This is to avoid fines given out by city authorities for failing to maintain safe conditions in the neighbourhood during the coldest time of the year.

The neighbourhood 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. The 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

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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 Harold signing the documents for the first stage of the agreement to be cryonically preserved by an organization based in the US. 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'll wait for the ice cream, which one of the members always brings.

Though the major 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 didn't celebrate the occasion himself, but he seemed happy to be able to wish a Merry Christmas to others.

That first party, I 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 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, beaming, smile stretched across his face and eyes bright. He said that in the near 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 newer versions. 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.”

“Technology is growing exponentially.” Though people who display as much hope and confidence in this declaration as Joseph does may be uncommon, the declaration itself is not. 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. Physicist and public intellectual Michio Kaku recently 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) In Moore’s Law, we see the first of a series of interesting mixtures associated with the figure of the exponential. Declarations of the ‘natural’ progress of technology are acts of anticipation, operations of a future forecast which writes its own past in the present.

Ray Kurzweil, a prominent futurist and figure in the transhumanist movement, is particularly fond of Moore’s Law and exponential curves. His most recent book, *The Singularity is Near* (Kurzweil 2005), includes countless graphs of many different areas of technology and society, showing how they follow the same exponential rate of change. Most of these graphs are plotted on a logarithmic scale, so instead of the familiar curve, exponential change shows up as a straight line. There are graphs for Moore’s Law, 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, private manufacturing output, and US war deaths.

The exponential is powerfully illustrated in a recent documentary on Kurzweil called *Transcendent Man*, which made its Canadian debut last year at an ecological film festival in Toronto. ((Ptolemy 2010) Show section of “Transcendent Man” beginning 13:24, 1:30 long.)

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Notice the flash and bang when the rumbling red trajectory reaches its highest visible point, and recall the mysterious source of light at the end of the exponential curve in the painting I introduced at the outset.

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 cells dividing in fast-forward. The world of our recent experience, consisting of cars, computers, and the internet, is given as much time as the billions of years of evolution which 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. According to Kurzweil, as one paradigm of evolution forms the foundation for the next, the speed at which progress can occur increases. And as we are propelled along this accelerating trajectory, we will quickly find ourselves at that moment right before the flash, before a bright light which obscures where we are headed. There we may find illumination as in the painting, extended life and durable youth as Joseph foresees, or any number of other possibilities for a radically different future proposed by other transhumanists.

But entangled with these hopeful forecasts is a set of persistent anxieties. The sense of crisis associated with Moore's Law and the end of exponential growth is palpable in so many pixelated webpages, but it is also materially manifested in the lives of the Toronto cryonicists. Joseph's worry about his own survival until the arrival of appropriate technologies from the future is indicative. He is concerned about dying before technology can save him, that the treatments and enhancements he will need will arrive only moments after he dies.

Recall the painting I introduced earlier. Though the curvature of exponential change is shown, one cannot understand from this graph where the present is. Do we have decades or centuries to go before we reach the moment of take-off? Across the dozens of graphs presented by Kurzweil, we see a similar temporal indeterminacy. Even if the hypothesis of exponential growth holds, there is a great deal of latitude in figuring when the exponential curve will actually 'take-off'. (In fact, one of the favorite conversation topics among transhumanists is when this take-off will occur.) This is also one of the main anxieties surrounding Moore's Law. When will Moore's Law end? What technologies can help us delay its end?

This is why Joseph and the others spend significant amounts of time and energy ensuring that they are aware of new research and treatments as they become available, wading through websites and news stories, exchanging new information, and traveling to various meetings and conferences, actually and virtually. The real-time-ness of their interaction with information is extremely important, because when acceleration truly begins, it will happen quickly, and one must be prepared.

For the same reason, the everyday undertakings of the cryonicists are marked by a sense of crisis and emergency. Just as they must anticipate the moment of exponential take-off, they must also anticipate the moment of their death, which can be of two kinds. First, a 'bad death' can permanently prevent one from living in the future that one anticipates. A 'bad death' makes one a corpse rather than a patient. The worst kind of death would be one in which the body and brain were physically destroyed. Cryonicists often have provisions in their agreements which

stop their preservation if their bodies have suffered too much damage. For example, one form of bad death is the ‘information-theoretic death’, in which the pattern of information in the brain is irreparably destroyed.

A ‘good death’ or a ‘deanimation’ represents the possibility of admission to the anticipated future. A ‘good death’ is easily foreseen and prepared for. It leaves the body, and particularly the head, unmarred. If a cryonicist must die, then the best kind of death, Joseph told me, was by cancer, because it follows a relatively predictable progression meaning that all the necessary preparations can be put in place. In order for a patient to be cryonically preserved in the best possible condition, it is imperative that preparations begin as close to legal death as possible. Ideally, a patient’s death would be known several days in advance, so that the stand-by kit, consisting of necessary equipment, such as an ice bath and protective chemicals, is waiting at the patient’s side.

In order to ensure that they avoid the worst kind of death, they take care to be aware of their own and each others’ conditions as much as possible. They call each other often, assigning one person to check on another by phone every few days. This is to make sure that if one of them has died and not been discovered, the body is not allowed to decompose for very long. They hold meetings one evening a month for a similar purpose. Each summer, they bring out and assemble their stand-by kit, assembling all the pieces and testing out the equipment, making sure that it too is in the best condition to act when called upon. (Although at one particular party, some members began to joke and express anxiety when the assembly of the pieces of the stand-by kit began to take much longer than expected. “The patient is already too far gone!”, one person exclaimed.)

One member, Alex, showed me his cell phone, which contains ICE numbers - ICE stands for “in case of emergency”. If he is discovered dead or dying, the phone contains instructions for these numbers to be contacted. First among these is his cryonics service provider. The other four numbers he’s chosen are for fellow cryonicists, who would know how to react in the event of his death or incapacitation. His wife is not among those to be contacted immediately. What Alex views as a rational and prudent act to ensure the best possible death is enacted through a sociality which makes its organizing principle the immediate response to everyday risks in relation to an anticipated future.

To these networks are enrolled an array of non-human actors, many of which are constantly worn or carried, maintaining close physical proximity to the patient. Some members of the group are developing devices or software which will automatically contact others in case of emergency, drawing on consumer technologies for monitoring personal and biological information to add another layer of redundancy to their self-protective mechanisms. A device demonstrated at one summer party promised to call for immediate help if a cryonicist was to die while sleeping. All the cryonicists who have finalized agreements with their service providers also wear metal tags or bracelets, which display phone numbers for cryonics providers and instructions to emergency responders for dealing with a cryonicist’s body.

Harold, who had wished me a Merry Christmas at the Bedford Day party, carried additional worries. Since I first met him, we have kept in fairly regular contact. We see each other at the

monthly meetings, and exchange e-mails from time to time. When my family and I were caught in Tokyo on March 11, he checked on us and let the other cryonicists know we were ok. When I told him that my wife and I were expecting a son, he began talking to me about his own children, now in elementary school, always with a look of joy.

During one of these conversations, he made known to me one of his deepest anxieties. He was signed up to be preserved with a company in the northeast US. His wife, however, was not interested, though she didn't stand in the way of his decision to sign up. His children are still too young to choose, and he said he worries about what he would do if his children chose not to be cryonically preserved, or if his wife opposed it. We stood in the living room at one party, when he paused and drew a calming breath, before saying, "I don't know what I will do." It was a thought that he tried to put out of his mind for the moment. It had to be deferred until a time when his children would be able to choose, but the thought that his best efforts might still leave him without his children was not a possibility he felt ready to act upon. For Harold, who lives in a present in which he has the choice not to die, the inability to act for his children and the possibility that they may be prevented from pursuing cryonics as he has, is experienced as the denial of a life saving medical treatment to a loved one, sentencing them to certain death.

In this final section, I would like to highlight again several elements from the material I have presented within a discussion of the framework of anticipation. As I mentioned at the beginning of this talk, anticipation is a way of making sense of the associations between speculative modes of knowledge production, affective states in particularly situated contemporary subjects and collectivities, and a moral economy. Transnational in scope, the idea is inflected by discussions of 'global assemblages' put in motion by Aihwa Ong and Stephen Collier, and draws from analyses of emerging biopolitical subjectivities, as developed by people including Paul Rabinow and Nikolas Rose. Moreover, it is an attempt at developing analyses of 'speculation', for instance in the work of Caitlin Zaloom and Karen Ho, beyond the realm of finance.

One of the significant features of regimes of anticipation is that they "enable the production of possible futures that are lived and felt as inevitable in the present, rendering hope and fear as important political vectors." (Adams, Murphy and Clarke 2009, 248) Like the 'natural'-ness of the trajectory of Moore's Law, the trajectories of all of the exponential curves I have mentioned are seen as ineluctable forces of nature, of history, and of human and non-human life and information. Piling natural evolutionary history on to political economic and technological histories, the exponential curve marks the bare topology of a temporal landscape whose inhabitation is the task of present and future humanity.

I use Adams et al.'s notion of anticipation to emphasize the salience of several ways in which this temporality is occupied. First, they point out that speculative modes of knowledge production – prediction and speculative forecast – pervade a lived present characterized by the need to negotiate various uncertainties. It "conjures," as they write, "versions of the present as sites of contingent and malleable action." (251)

The obsession with exponential change, as exemplified by Ray Kurzweil, shows the importance of speculative modes of knowledge production to my informants. The exponential

curve is an icon mobilized to make sense of the future in relation to the present and the past. Trends can be extrapolated into the future, which place events in the present within a single framework of exponential evolution, whether they occur in the areas of biology, information technology, economics, or any others. Because of the temporal indeterminacy of the curve, uncertainty pervades the present experiences of transhumanists, who engage in various practices to negotiate possible versions of the present, some of which I have described here.

Second, speculation of this kind generates particular affective states, which they describe as “an excited forward looking subjective condition characterized as much by nervous anxiety as a continual refreshing of yearning, of ‘needing to know.’” (247) Anticipation is characterized by entangled states of hope and anxiety, a sense of possibility towards that which is anticipated conjoined with the anxiety of weighing various risks against each other, or a fear of the sudden, unpredictable irruption of the unanticipated. We can see such things through the discussions of ‘crisis’ related to Moore’s Law which is tied to the hope of continued economic growth. We can also see this through Joseph, and the intense optimism and excitement he feels towards the future, tempered by the ever-present feeling that his death will come just a moment too soon to be able to experience it without the aid of cryonics. It is in the fear of the likelihood of a ‘bad death’, and the preparations they undertake to ensure a ‘good’ one.

Third, anticipation also entails a “will to anticipate” (254), a moral imperative to speculate. One must always refresh and update one’s own knowledge of current and coming situations, new risks and possibilities. They write that there is an “obligation to ‘stay informed’ about possible futures [which has] become mandatory for good citizenship and morality, engendering alertness and vigilance as normative affective states.” (254). Cryonicists see virtue and good in knowing something as soon as it can be known, and in acting in accordance with the view that the risk of death and injury are ever present, which they experience as the need to be aware of and to act on themselves, their peers, and scientific developments in real-time. They experience what, the authors write, is “[t]he palpable sense that things could be (all) right if only we anticipate them properly[.]” (259)

Fourth, Adams et al. briefly speak about the generation of transnational, multi-sited collectivities associated with anticipatory regimes. A grouping which seems neither like a network nor a community in the conventional senses of those words, but a form of relationality characterized most closely by ‘assemblage’ which implicates the modes and technologies of knowing as much as the humans who come to know and act. It is a hybrid mixture of actors which find themselves in the thrall of speculative forecast, the affective dimensions of anticipation, and its moral economy.

Although I myself have only briefly touched on this aspect of the exponential in the talk, I want to suggest that the work that the cryonicists and others do in maintaining contact with each other, and in enrolling various devices and technologies that both provide them with information about themselves, and which would ideally act in their interests in their stead, indicate that a particular kind of sociality is associated with the figure of the exponential. That is, in order

to be able to undertake anticipatory acts, they must have a network of human and non-human allies.

In this paper, I hope to have suggested how the world looks and feels to cryonicists and other transhumanists, who have, in place of the eternal, found hope, and also anxiety and fear, marked by the figure of the exponential curve.

Where Pope tied hope to the eternal universe, the fundamental unknowability of the future, and anticipation for what lies beyond the hard boundary of death, among Kurzweil, the Toronto cryonicists, and other transhumanists, hope but also anxiety are entwined with the possibility of forecasting probable futures which materialize their present worlds in particular ways. Viewed through the framework of anticipation, the exponential becomes legible as a mediator in a material-semiotic regime of anticipation. Reaching back from the future, the exponential curve both foretells the future and drives its creation in the present, making the anticipated future feel inevitable. In its inevitability, it entails certain affective orientations, both hopeful and fearful, which are produced within a moral framework which valorizes the 'will to anticipate' and engaging the future in the real-time of the present as much as is possible.

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