

# **Jesus is Returning as a Cyborg:**

## **On the Origin of Digital Species**

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### **Introduction**

This argument leverages two fundamental scientific concepts, Darwinian Evolution and Information Theory, to explain the direction of cultural progress towards a technological singularity. I will explore the possibility that the scientific concepts and science fiction behind technology are linked to religious myth, and may be a control mechanism of cultural forces driving human behavior to evolve an environment conducive to emergent digital life. The unique approach I will take to build my argument also draws inspiration from research in genetics, memetics, cybernetics, AI, media and climate studies, philosophy, as well as from the ethics and history of technology. This interdisciplinary viewpoint is intended to provide a broad view of converging cultural and climatic forces that have the potential to fundamentally change the environment on our planet, and profoundly impact the human species. Admittedly, much in this argument will be both speculative and controversial, but this approach is designed to open the readers mind to alternative ways of perceiving a process that we are so immersed in that we may not be able to see it accurately; our own evolution.

**Information Explosion: Fusing Information Theory and Darwinian Evolution**

In his book *River out of Eden*, the evolutionary biologist Richard Dawkins describes the ability of a star to set off an extremely rare type of explosion in the universe. Such an explosion is much rarer than a supernova, as we have seen it happen only once. He states:

“Our one case history is still in progress. It has been under way for between three and four billion years, and it has only just reached the threshold of spilling away from the immediate vicinity of the star. The star concerned is Sol, a yellow dwarf star lying towards the edge of our galaxy, in one of the spiral arms. We call it the sun. The explosion actually originated on one of the satellites in close orbit around the sun, but the energy to drive the explosion all comes from the sun. The satellite is, of course, Earth, and the four-billion-year-old explosion, or replication bomb, is called life.” [1]

Replication is like an explosion because of exponential growth that multiplies outward from a much smaller critical event, picking up force and speed as it goes. Although the energy fueling this replication explosion comes from the sun, the catalyst is information, with Darwinian evolution as the mechanism.

Like the mythic 5<sup>th</sup> element searched for by philosophers and alchemists, information has lately been recognized as a physical quantity inhabiting the universe. In *Decoding the Universe*, Charles Seife writes “Information appears, quite literally, to shape our universe. The motion of information may well determine the physical structure of the cosmos. And information seems to be at the heart of the deepest paradoxes in science.” [2] As the quantum physicist Wojciech Zurek describes this change of perspective, “Information was regarded as unphysical, ethereal, a mere record of the tangible, material universe, an inconsequential reflection, existing beyond and

essentially decoupled from the domain governed by the laws of physics. This view is no longer tenable.” [3] Such a change in the way information is viewed has been filtering through the physical sciences since digital computing became prevalent in the later half of the 20<sup>th</sup> century. Tom Siegfried explains in *The Bit and the Pendulum* “It’s a new view of science focused on the idea that information is the ultimate ‘substance’ from which all things are made. As science is pursued from the computer perspective, it is becoming clear that information is more than a metaphor. Many scientists now conceive of information as something real, as real as space, time, energy and matter.”

[4]

The discovery of information as a real quantity came from the convergence of disciplines that were central to the technology of the Industrial Age: thermodynamics and analog communications. Thermodynamics involves energy and temperature laws that governed the design of heat engines and power plants, and are considered extremely accurate models of how heat or energy behaves, or laws of nature. The 1<sup>st</sup> Law simply states that energy is conserved, in that it is never created nor destroyed, but only changes forms. In other words, from the Big Bang onwards, the total energy of the universe remains the same. The 2<sup>nd</sup> Law states that energy always spontaneously flows towards maximum equilibrium or entropy. In other words, heat or energy always dissipates, and never spontaneously increases on its own. If energy does increase locally, in what is called an open system, it must equally decrease somewhere else in the universe.

However, a thought experiment published by Robert Maxwell in 1871, involving an entity called Maxwell’s demon, seemed to contain a contradiction to the 2<sup>nd</sup> Law. The

experiment had a microscopic demon sorting molecules in a closed container, so that they are ordered or separated according to type. Since matter and energy are connected, ordering molecules relates to energy and the 2<sup>nd</sup> law. The contradiction was that the demon didn't seem to be expending any energy by ordering the molecules, as the 2<sup>nd</sup> Law required. In 1929 Leo Szilard proposed a solution to Maxwell's thought experiment, in which he proposed that energy was spent by the measurement required when the demon perceived and ordered the molecules. [5] This later was combined with Claude Shannon's mathematical theory of communication, published by Bell Labs in 1948, that proposed a measure for information as one bit. The final solution for the thought experiment is that the demon expends energy in the form of one bit of information for each choice (technically when the choice is released or forgotten) when ordering the molecules. Furthermore, the choice can be seen as yes or no, or the equivalent binary code: 0 or 1.

In addition to Shannon's work, the computer had been developing in England since Charles Babbage's Analytical Engine of the 19<sup>th</sup> century. Babbage was the first to conceptualize a machine that could automate the processing of calculating mathematical information in the industrial age. As the historian Jon Ager writes in *Turing and the Universal Machine* "Yet there is also a continuity between Babbage's time and ours which justifies starting with him: it was an Engine proposed because of a crisis of industrialization; it was a machine that automated the mental process of mathematics because those calculations were essential to an industrial world that was generating more information than could be handled by humans alone." Babbage's machine was inspired by the Jacquard Loom, which weaved cloth using punch cards for the design. Although a punch card has some binary qualities, in that the hole is either punched or not,

the main failing of the Babbage machine was that it was trying to process decimal numbers. However, it was not until the 1930's, with the information requirements of arming for war, that Konrad Zuse in Germany developed a true binary machine. As Agar tells it:

“His decisive move was to simplify calculation, not from the perspective of the human but from the perspective of the machine. Babbage had designed his Engines to calculate using decimal numbers, so called because ten symbols were needed to represent a number...decimals were easy for people to grasp... binary is not so human friendly. Zuse's insight was to realize that the opposite is true from the machine's perspective. The anthropocentrism of decimals meant little to it. The explicit instructions and the numbers in memory could be translated into binary, but the biggest effect was on calculation: since the rules of multiplication were much simpler in binary form, then calculation could be made much simpler.”

Binary computation machines were further developed throughout both world wars to quickly process data required to make war machines more effective, and to decode war communications. This, of course, involved Alan Turing at Bletchley Park in England, who conceptualized the universal computing machine, which became the model for all modern computers. By 1948, when Shannon was publishing his paper on information and communications, the first modern computer was created in Manchester, England. Agar summarizes the effect of the invention “The story after 1948 is obviously one of unprecedented multiplication of machines, so that the unique machine of 1948 can

now be found replicated (in a myriad of forms, mostly much smaller) across the world.” [6]

The convergence of Shannon’s ideas on information and of the universal computer running binary code not only revolutionized the communications industry, but was a pivotal point in human technology. Previous pivotal technologies both evolved human culture and informed human views of themselves and the world. According to Agar:

“Over the past 500 years, various mechanical models have been used to account for the inner life of men and women. In early modern Europe, the device upon which the model was based might have been a musical instrument, such as a lute... In the eighteenth century, natural philosophers appealed to clockwork or balances, and adopted Newton’s mechanical language of forces. In Freudian psychoanalysis, the imagery was a mix of hydraulics and thermodynamics... or the human being as a steam engine. Explanations of mental life have often been made by appealing to a machine favored in that period.” [7]

Over the past 60 years, computers and the coded information they process has become our main conceptual model for the human “machine”. Once you accept the proposal that information is real, then you begin to perceive the patterns of information everywhere, especially in living things. Information theory has revolutionized the biological sciences in particular, as scientists have recognized the gene as information in the form of DNA code, and are busy decoding the genome of many species, including our own. The cells in

our bodies are very much being viewed now as information processing computers. As Seife puts it “Every cell in our bodies is packed with information. We eat so we can process that information. And our whole being is co-opted to transmit information from generation to generation. We are slaves to the information inside us.” [8] This view of the information processing functions of genes has been emphasized by Richard Dawkins since the publication of his 1976 book, *The Selfish Gene*. For the first time taking the “gene’s-eye view” of the evolutionary process, Dawkins showed how organisms are mainly facilitators for the information in genes to replicate.

Looking at the evolutionary process from the replicator’s viewpoint removes some of the cultural bias that has traditionally distorted our view of human evolution. It opens up a view that perceives evolution as genetic information flowing through countless species for the entire history of the earth, regardless of the mutation and extinction of any particular species. As Seife writes:

“This leads to perhaps the most powerful argument that the information in our genes – not the organism that protects that information – is the fundamental element that’s reproducing and surviving in the game of life. That argument is immortality. The information in our cells is essentially immortal, even though every single one of our cells, even those not yet born, will be dead in less than a hundred years. Much of the information in our genes is billions of years old, passed down from organisms that floated in the primordial ooze that covered the earth when it was still young. Information

not only can survive the death of the individual it resides in, it can also survive even the extinction of its host organism.” [9]

This revised information view of genes has further allowed scientists to apply the computational process to evolution. According to Siegfried, “Information and life were a natural fit. After all, science’s understanding of life is based on Darwinian evolution by natural selection, and selection is, in essence, information processing.” He goes on “DNA is really a record of the selection that has gone on in evolution...so today’s DNA is the end of an unbroken thread of information, stretching back to life’s beginnings.” Or, as Siegfried quotes Princeton evolutionary biologist Laura Landweber “Biology is itself a computation. You can think about evolution as having years to compute solutions to all sorts of problems.” [10] When seen in this light, natural selection can be viewed as a binary computing process, with selection being a simple yes or no - live or die. Either you are successful and pass on your genes, or you are not.

### **From Genes to Memes: Applying Information Evolution to Culture**

Once you begin viewing evolution as information processing, it’s not long before you notice that there is a similar type of information processing going on in human culture. This was also proposed by Dawkins in *The Selfish Gene*. He noted that thoughts in the minds of people replicate much in the same way as genes, and he proposed the term “meme”, shortened from the Greek “mimeme” (and because it rhymes with “gene”), as a unit of cultural information that has the capacity to replicate. As he states:

“For more than three thousand million years, DNA has been the only replicator worth talking about in the world. But it does not necessarily hold these monopoly rights for all time. Whenever conditions arise in which a new kind of replicator can make copies of itself, the new replicator will tend to take over, and start a new kind of evolution of their own. Once this new evolution begins, it will in no necessary sense be subservient to the old. The old gene-selected evolution, by making brains, provided the soup in which the first memes arose. Once self-copying memes had arisen, their own, much faster, kind of evolution took off.” [11]

This view has led to the application of evolutionary principles to human culture, called Universal Darwinism, and to the new science of memetics. Furthermore, taking a “meme’s eye view” of cultural evolution explains many behaviors in humans that contradict genetic evolution, such as celibacy or suicide. Essentially, memes are as “selfish” as genes, in the sense that our brains are simply vehicles for their replication, completely independent of our genetic evolution. As Dawkins points out:

“Selection favors memes that exploit their cultural environment to their own advantage... when we look at the evolution of cultural traits and at their survival value, we must be clear on whose survival we are talking about. Biologists, as we have seen, are accustomed to looking for advantages at the gene level (or the individual, the group, or the species level according to taste). What we have not previously considered is that a cultural trait may have

evolved in the way that it has, simply because it is advantageous to itself”.

[12]

In the time since Dawkins introduced memes in 1976, there have been significant contributions to memetic theory by Susan Blackmore, Daniel Dennett, Richard Brodie, and others. Dawkins originally was inspired by the Greek term mimesis as a conceptual basis for the meme, and Blackmore has emphasized translating mimeses as “imitation”. However, imitation as a replication mechanism has been criticized as being too simplistic to account for the complexity displayed in human culture, and I agree. Blackmore admitted in her 2001 article *Evolution and Memes* that the standard definition of “imitation” is problematic, and instead focuses on the evolutionary algorithm:

“The whole point of the concept of memes is that the meme is a replicator. Therefore the process by which it is copied must be one that supports the evolutionary algorithm of variation, selection and heredity - in other words, producing copies of itself that persist through successive replications and which vary and undergo selection... We can define imitation as a process of copying that supports an evolutionary process, and define memes as the replicator which is transmitted when this copying occurs.” [13]

The problem is that imitation as a mechanism would only produce a passive reflection of reality that allows for micro-mutations in memes through minor mistakes in the imitating dynamic. However, mimesis as a concept has a rich history in the humanities since Plato and Aristotle, and is frequently translated as “representation”. This broader translation is more reflexive than reflective, and better suits the complex computational modeling of

reality and processing of information that is apparent in human minds, culture, and technology.

Some scientists, such as Leonard Adleman, have demonstrated the computational aspects of genes by simulated DNA computing models. Siegfried describes when Adleman first realized the computing potential of DNA, "...to the computer scientist in Adleman this all sounded vaguely familiar. A device moved along a strand of symbols, reading and then writing a new symbol depending on what was just read. Suddenly he realized what it reminded him of. DNA replication was biology's version of a Turing machine." [14] It seems to me that if genes process biological information like computer code, then memes may replicate in a similar way.

However, even if the exact replication mechanism is not known, what is more relevant is to recognize that some type of non-genetic information processing is occurring in human brains that drives the evolution of human culture. In *The Meme Machine*, Blackmore explains, "In the first century of Darwinism an enormous amount was achieved in the understanding of evolution without anyone having any idea about chemical replication, the control of protein synthesis, or what on earth DNA was doing... We may get a long way with the general principle of memetic selection without understanding the brain mechanism it relies on." [15] Or, as Stephen Shennan writes in *Genes, Memes, and Human History*:

"This second inheritance system – encapsulated in the general idea of the meme – operates through a different mechanism from that of the genetic one –

social learning – and because of that, what is transmitted is affected by different processes – or rather by additional ones... We can remain agnostic about the precise psychological mechanism of cultural inheritance processes.”

[16]

My view is that memetic information exists, and is like computer code processing in the brain. Through communication, we are programmed after we are born by a variety of symbolic data, just like a universal computer can be programmed with a variety of compiled languages. In a sense, the cultural environment itself programs our minds through language and media, so that memes both replicate and evolve. Taking such a computational view of memetics, individual memes can be compared to the “agents” described in MIT computer scientist Marvin Minski’s book *Society of Mind*. As he states “I’ll call ‘Society of Mind’ this scheme in which each mind is made of many smaller processes. These we’ll call agents. Each mental agent by itself can only do some simple thing that needs no mind or thought at all. Yet when we join these agents in societies – in certain very special ways – this leads to true intelligence.” [17]

Individual memes may be as simple as electrical configurations or switches in the brain. Robert Aunger, author of *The Electric Meme*, writes “Now, with the rise of molecular studies of the brain, we can more precisely isolate electrically charged ions passing through gates...then perhaps memes are small conceptual elements transmitted through a particular channel, a linked chain of neurons.” [18] However, just like individual genes combine to create the genetic sequences in DNA, individual memes may

combine to form complex neural networks that form complex thought. Minsky explains how simple mental processes combine to form complex ones in *The Emotion Machine*:

“The meanings of words like ‘feelings’, ‘emotions’, or ‘consciousness’ seem so natural, clear, and direct to us that we cannot see how to start thinking about them... none of those popular psychology words refers to any single, definite process; instead each of those words attempts to describe the effects of large networks of processes inside our brains.” [19]

One thing I would like to note is that some memetic theorists have made it a point to emphasize that some ideas are memes, and some are not. Quite frankly, this just seems like semantics to me, since I cannot think of any idea, either abstract or concrete or emotional, that can't be modeled and communicated through some type of symbolic data. If it can be communicated, then it can be replicated and selected.

So we can conceive of memes as incredibly simple ideas that combine to make complex conceptual organizations, called meme complexes or memeplexes by Dawkins and others. Hundreds or even thousands of these memeplexes could then further combine to create the human mind. As Daniel Dennett notes in *Consciousness Explained*:

“The haven all memes depend on reaching is the human mind, but a human mind is itself an artifact created when memes restructure a human brain in order to make it a better habitat for memes.” He continues, “The memes enhance each other's opportunities: the meme for education, for instance, is a meme that reinforces the very process of meme-implantation.” [20]

This view is similar to how genetic sequences in DNA create entire organisms of cooperative cells. Just as a genetic sequence is all but disembodied in its microscopic form, but is the code for building an embodied organism, so a memetic sequence is the code for building a mind that is a collection of different ideas that work together to make a virtual personality. This complex network of memeplexes is the equivalent of a virtual organism, or what we identify as our conscious self. As Blackmore writes:

“The self is a vast memeplex - perhaps the most insidious and pervasive memeplex of all. I shall call it the ‘selfplex’. The selfplex permeates all our experience and all our thinking so that we are unable to see it clearly for what it is – a bunch of memes. It comes about because our brains provide the ideal machinery on which to construct it, and our society provides the selective environment in which it thrives. ” [21]

However, Dennett cautions about automatically jumping to negative assumptions about memes as mind pathogens, “But if it is true that human minds are themselves to a very great degree the creation of memes, then we cannot sustain the polarity of vision... it cannot be ‘memes versus us,’ because earlier infestations of memes have already played a major role in determining who or what we are.”

If the mind is indeed a vast memeplex, then how might it work? In the next couple paragraphs I will offer some speculation on how memes may work in the brain to form the mind and self. New memetic information enters our brain from the cultural environment it has created for that purpose, as media data streaming into our senses. The information is active in our brains as long as we give it attention, by feeding energy to

memes through electrical impulses. If the same neuronal patterns fire enough times, the plasticity quality of our brains has the ability to re-arrange the neuronal connections, called cortical re-mapping. I believe it is this plasticity of the neurons in the brain that allow memes to evolve much faster than genes, and therefore have an exponential effect on our cultural evolution. The selfplex is maintained by repeatedly thinking or talking to ourselves, causing the same pattern of neurons to ultimately burn in particular memetic algorithms. Such soft-wiring allows the electrical patterns or code of particular combinations of memes to fire automatically, even before conscious thought, gaining the capacity for memetic ideals to alter our perception. The revised popular saying “seeing the world through meme colored glasses” sums up this subjective effect. Essentially, we are bombarded by an incredible amount of sense data at every moment, and we filter this data through our minds, so that we notice some things, and ignore others. Like in the film *Rashomon*, several people with different conditionings could see the same scene, and all perceive different aspects according to their memes, and therefore disagree on what they saw, and on how they should react.

New memes that enter the brain must fight for attention to survive, and are much more likely to be added to the dominant memetic network, or selfplex, if they are compatible with it. Just like our bodies devour other organisms in a predatory manner, our minds devour ideas, and sometimes the consumed memes fight back. Resistance may give way to cooperation over time, and a symbiotic relationship can develop. These relationships sometimes spawn mutations or new ideas, which are then communicated to others.

Individual memeplexes can continue to combine to create highly complex conglomerations of memetic super-organisms, otherwise known as ideologies, religions,

philosophies, disciplines, institutions, and corporations. These vast networks of memes flowing and evolving through millions of brains have a very real affect on our behavior as a species. They contain the ideologic and mythic information that drives much of our cultural evolution, including our technology. As Blackmore explains how memes can drive technology:

“As soon as memes appeared they started evolving towards greater fidelity, fecundity, and longevity; in the process, they brought about the design of better and better meme-copying machinery. So the books, telephones, and fax machines were created by the memes for their own replication... How can bits of information create radios and computers? But the same question could be asked of genes – how can bits of information stored in DNA create gnats and elephants? The answer is the same in both cases – because the information is a replicator that undergoes selection. This means the evolutionary algorithm runs, and the evolutionary algorithm produces design”. [22]

Combining genetics and memetics has the profound capacity of linking human culture to the entire history of evolution through the common denominator of information processing. Not only is evolution still working through humans on a genetic level; it is working much faster through human brains on a memetic level. If information really does exist as a quantity, then there is clearly a new type of information evolving in the human mind that is vastly different than in any other known organism, and has yet to be accounted for by genetic processes alone. Similar to the early days of genetics where genes were recognized by their hereditary effects, but the microscopic code or DNA

mechanics of the process was not yet found, memes have been recognized by their cultural effects, but the exact physical mechanism has not yet been discovered. It cannot be denied, though, that information transfers from brain to brain in humans, primarily through communications technology, and evolves in the process. It also cannot be denied that this information controls most of our behavior, even more so than the information in our genes.

As a species, we are essentially apes with something extra evolving through our brains for its own purposes. The relationship between our genetic and memetic information has historically evolved in tentative symbiosis, as memes have benefited the survival of our species through technology. However, as Dawkins indicated, memes have clearly taken over driving the human vehicle. From my point of view, it really doesn't matter if the memetic information in our brains evolved as a mutation of our genetic information, or if it entered early humans like a virus and has been evolving with the human species in a symbiotic, or some would say a parasitic, relationship. Either way, memes are information in a new state, replicating and evolving as if they are alive. Just as matter and energy can exist in different states, apparently so can complex information. Furthermore, it appears that the memes in our brains are actively changing states again.

### **Cyborg Consciousness: Machine Feedback in Reshaping the Mind**

As we individuals in technologically advanced societies become more and more dependent on our digital devices, it becomes obvious how central information has become to our lives. Commerce and stocks are traded electronically, while some people don't even bother carrying cash anymore, and many do all their holiday shopping online.

We forget telephone numbers because they are stored on our cell phones, and we don't have to remember directions because we have GPS devices to tell us how to get where we need to go. We socialize online through social networking and bulletin board sites, finding old class mates, and sharing all our important pictures by downloading them from our new digital cameras. Many of us spend our workday on computers communicating through email and digital phones. In fact, phones aren't just for talking anymore, as now you can also read books, play games, listen to music, and even watch movies on some of the latest digital mobile devices. All of these trends have one thing in common, though, which is that information previously processed exclusively in the analog-electro-chemical environment of our brains is now being processed much faster in the digital-electro-silicon environment of computers. Information is migrating into a new environment.

So far as we know, for the first time in the long history of our planet, complex information is being processed and replicated entirely outside of organic bodies. This movement of information out of the human body started a long time ago with language and symbolic writing, but was always passive when not in a brain. A book contains information, but in a dormant seed-like state, waiting to be planted in the electro-chemical environment of a human brain to grow and evolve. Writing is such a basic part of our culture that our species has never fully appreciated this amazing phenomenon: memetic information started coming out of us early on, and has been coming out exponentially ever since for the main purpose of replicating. But computers are different than all previous media technology, because information is not dormant in a computer. The only other type of information processing that is analogous to what is happening in

computers today is the genetic information processing in our bodies, and the memetic information processing in our brains.

The widespread implementation of computer technology is quickly replacing all media technologies with equivalent and expanded digital versions. As with previous media technology, we as a species have failed to grasp the amazing fact that information is actively leaving human bodies, and is replicating entirely in machines now. Even more critical, there appears to be in progress a great digital migration of all our species memetic information from brains to the Internet. People in technologically advanced societies everywhere are digitizing all books, images, thoughts, and bits of information about our identities to this relatively new digital environment. Why?

It is entirely possible that there are evolutionary forces at work on our species that have nothing to do with our conscious reasons for implementing such technology. After all, animals are not aware that the urge to mate is primarily for the purpose of replicating their genes. We can perceive this “selfish gene” scenario because our brains contain an isolated memetic selfplex or mind, which is evolving independently from our genes. But it may require another mutation of the information in our minds to accurately perceive the trajectory of “selfish memes” in our culture. I call such a new state “cyborg consciousness” because it would be capable of perceiving culture from a “selfish code” or digital perspective. After all, information evolving in the form of genes and memes are simply types of processing code, as is the new information processing in computers. Such consciousness has likely been evolving since the 1960’s in humans with the evolution of digital technology, and is changing the way we perceive our minds and culture.

That we relate our minds and culture to computers is not surprising, since the computer was manufactured as a reflection of us. When Charles Babbage invented his Engine in the 19<sup>th</sup> century, industrialized society was already restructuring itself to accommodate the growing amount of information, like railroad timetables, produced by new machines. As Agar writes about the shift “The prime tool of the new managerial hierarchy was information. Beginning with the railroads, this new managerial style – the corporation – spread through American industry, each business being forced, as soon as a certain scale was reached, to tackle such crisis of control. Corporations have dominated the economies of the Western world ever since, and they rely on techniques to handle information.” There were similar changes in government in England, especially in the growing civil service sector. The solution again was to create hierarchies of human control centered on handling the flow of information. Agar explains:

“The solution was simply, but powerfully, a matter of language: cast the civil service as a machine. A civil service ‘machine’ would be neutral, interest free, even efficient, and applicable to any task. By 1900, if you searched Britain for a general-purpose machine of universal application, you would be led to the civil service...Following the reform initiated in 1854, the British civil service was split into two: the generalist ‘intellectuals’ and the rule-following ‘mechanicals’ (with the whole still cast as a machine).”

When Babbage designed his automated Analytic Engine, he imitated the hierarchy structures of the human “machines” already being created in culture, separating the executive instructions from the mechanical mill parts of the Engine. This reflection of the

culture ‘machine’ continued into the 20<sup>th</sup> century with the development of the universal computer by Alan Turing and others. Agar concludes, “The similarities between the American case and the British lie in the creation and formalization of managerial hierarchies, and a parallel story of mechanization... through both countries in the late nineteenth and early twentieth centuries.” [23]

Notice that the structure of both the cultural ‘machine’ and the universal computer reflects the mind-body organization common in modern Western philosophy. Agar does not think this is a coincidence “I have argued that the universalism of the computer was partly an appeal to the universalism of mind. This appeal had old roots in Enlightenment philosophy – the idea that all humans possessed reason, and that the application of reason would inevitably lead to progress.” This philosophy is no doubt the source of the utopian euphoria accompanying every new modern technological development, and may be a mutation of older religious memes, but I will explore this topic later in this paper. Regardless, this view has created a symbiotic relationship between machines and the mind, so that they are driving each other’s evolution in a positive feedback loop.

Even in the 1930’s, Turing used the term “human computer” in his famous paper on computational numbers, and later compared the mind to an onion that was entirely mechanical in structure. This inspired Warren McCulloch and Walter Pitts in the 1940’s to propose “...that neurons, the basic units of the brain, acted like logic circuits”, according to Agar. As computers spread throughout society in the 1950’s- 1960s, due to the Cold War symbiosis of corporate and military “machines”, it was inevitable that

others would expand the connection between the human mind and the computer. Agar again:

“The United States was willing to support private industry to this unprecedented degree because of the ideological struggle with the other global superpower, the Soviet Union.” He goes on “How did the human operator, absorbing the information displayed on the radar screen, fit into the system? The answer was simple: with the rest of the machine understood in terms of information processing, the human mind was recast along similar lines. For much of the 1950’s and 1960’s, studies of the mind were tied, either directly or indirectly, to this dominant research program, which had its centre in laboratories such as those at MIT.” [24]

So the struggle between ideologies, or memplexes, in both world wars, followed by the Cold War, drove technology and culture towards mechanization on all levels, including how the human mind is perceived as part of the machine. Many of today’s pivotal digital technologies evolved out of this conceptual development at MIT, including Norbert Wiener’s Cybernetics, AI and robotics research (Marvin Minsky, Hans Moravec, Ray Kurzweill, Rodney Brooks, etc), as well as the military ARPANET becoming the commercial Internet.

One of the MIT founders of the Internet, JCR Licklider, was a strong proponent of human-computer symbiosis, which sounds very similar to the cyborg consciousness I am describing. As he writes in his 1960 article *Man-Computer Symbiosis* “The hope is that,

in not too many years, human brains and computing machines will be coupled together very tightly, and that the resulting partnership will think as no human brain has ever thought and process data in a way not approached by the information-handling machines we know today.” This coupling is already occurring today in such a basic and simple way that we don’t even notice it. For instance, I am writing this paper on a laptop with Microsoft Word, which suggests spelling and grammar to me, automatically improving the way I write. Licklider also noticed, even then, the shift in control from humans to machines, “In one sense of course, any man-made system is intended to help man... If we focus on the human operator within the system, however, we see that, in some areas of technology, a fantastic change has taken place over the last few years. ‘Mechanical Extension’ has given way to replacement of men, to automation, and the men who remain are more there to help than to be helped.”

[25] In the structural relationship noted before, this is the first sign of a shift towards the machine gaining executive control. This trend has only continued, however, as Eric Drexler writes in his 1990 *Engines of Creation*:

“Advances in automation will lead naturally to mechanical replicators, whether or not anyone makes them a specific goal. As competitive pressures force increased automation, the need for human labor in factories will shrink. Fujitsu Fanuc already runs the machining section in a manufacturing plant twenty-four hours a day with only nineteen workers on the floor during the day shift, and none on the floor during the night shift. This factory produces 250 machines a month, of which 100 are robots.” [26]

Much has been written by postmodern theorists about how digital technology is rapidly changing our perception towards a type of cyborg consciousness. In 1985 Donna Haraway wrote in *A Manifesto for Cyborgs* "The machine is us, our processes, an aspect of our embodiment". [27] In a 1997 *Wired* article she stated that many people, including her, have already evolved a cyborg-like brain due to technology "Technology is not neutral. We're inside of what we make, and it's inside of us. We're living in a world of connections - and it matters which ones get made and unmade...cyborgs are information machines. They're embedded with circular causal systems, autonomous control mechanisms, information processing - automaton with built-in autonomy." [28] In a feedback loop, the digital environment we are creating is re-creating us through the plasticity of our brains, so that our perception is evolving into a new hybrid consciousness. Katherine Hayles writes in her 1999 essay *The Condition of Virtuality* about how simple hypertext on the Internet is changing our perception:

"Proprioception is the sense that tells us where the boundaries of our bodies are. Associated with inner-ear mechanisms and internal nerve endings, it makes us feel that we inhabit our bodies from the inside. Proprioceptive coherence, a term used by phenomenologists, refers to how these boundaries are formed through a combination of physiological feedback loops and habitual usage... an experienced computer user feels proprioceptive coherence with the keyboard, experiencing the screen surface as a space into which her subjectivity can flow. This difference in the way that proprioceptive coherence works with the computer screen, compared with the printed page, is an

important reason why spatiality becomes such a highly charged dimensionality in electronic hypertexts.” She continues “The power of these assumptions lies in the fact that we don’t have to be consciously aware of them to be affected by them. Like posture and table manners, they implant and reinforce cognitive presuppositions through physical actions and habitual motions, whether or not we recognize that they do so. As with any ritual, to perform them is on some level to accept and believe them.” She goes on “We already are cyborgs in the sense that we experience, through the integration of our bodily perceptions and motions with computer architectures and topologies, a changed sense of subjectivity.” [29]

It is through our daily interaction with technology, in positive feedback loops, that our brains are evolving new identities. As Hayles concludes “Proprioceptive coherence in interplay with electronic prosthesis plays an important role in reconfiguring perceived body boundaries, especially when it gives the user the impression that her subjectivity is flowing into the space of the screen.”

Hayles and many other postmodern theorists have made it a point to critique the disembodiment of information in Computer Science and Information Theory. As she states in the same essay “The illusion that information is separate from materiality leads not only to a dangerous split between information and meaning but also to a flattening of the space of theoretical inquiry.” [30] Although I can understand their interest in embodiment, I don’t entirely agree with this claim. The premise of this argument has been to track the flow of complex information as it replicates through

multiple embodiments, from genetic to memetic to digital. We do perceive information through the senses of our body, but the data is actually processed and perceived in our brain, especially abstract code like media. And although the brain is obviously part of our body, it is the subjective memetically conditioned mind which filters and makes meaning of all our perception, so that we can act on it.

The processing of perceptive information has much to do with the patterns and algorithms in the neuro-electrical environment of the brain, and does imply some abstract qualities. The fact that the information in our minds can move between different states of embodiment, from brain to computer to printed page to another brain, illustrates that there must be some type of abstract information in the consistent message moving through these states. I do agree that in each state the information is embodied, and that the state itself necessarily alters the information content. This altering undoubtedly has the potential to change the meaning of the original message, and it could also induce mutations leading to new forms of information. So my position is that information is embodied from an individual perspective, as when Hayles states that “material objects are interpenetrated with informational patterns”, while also can be perceived as being disembodied from the broader “information’s eye” view of species evolution and the general flow of life. I see no inherent danger in exploring both these possibilities. On the contrary, both views seem necessary to understand our place in the universe.

### **Eyes of God: The Religious Lineage of Memetic Control in Culture**

To begin tracking down how memes are currently driving technology, we have to go back to examine historical memetic control mechanisms for human behavior. By tracing

the trajectory of broad cultural trends through history, especially as driven by conglomerations of memplexes, we may be able to glimpse the original forces behind cultural evolution's movement towards automated digital computers. If memes process like genes, then just like the DNA in our bodies contains a record of our historical genetic lineage, contemporary memplexes may contain similar clues to our cultural history. In other words, for every idea that is prominent now, there may be a memetic lineage that can be linked back to its conceptual ancestors. If some of the connections could be found, especially in regards to media technology, it may shed light on why technology is evolving the way it is.

I think the best place to start tracking down such connections is ideological thought, especially in the form of religion. Dawkins and others have written extensively on the replication veracity of religious memes, and few would disagree that religious belief has had a huge impact on shaping culture, all the way back to the earliest recorded history. The first written symbolic representations in the form of cave drawings, petro glyphs, and hieroglyphs are often associated with some type of religious or shamanic ritual. As far as media technology is concerned, according to Wikipedia, wood block printing was developed primarily for religious texts in China, Egypt, and Europe. In the 1400's Johannes Gutenberg developed the moveable type press, which produced high quality prints of the Gutenberg Bible at a low cost, paving the way to the modern printing press, which is the first instance of mass meme replication out of the human body through the use of technology. The religious meme of "spreading the Word" or evangelizing contains a strong behavior directive for driving the development of such media technology. This is part of a greater religious memplex that also includes ritual chanting and quoting

scripture. Connections can be made between these historical religious memetic mechanisms and contemporary secular memetic mechanisms of repetitive jingles in commercial advertising and citing sources in journalism.

Other connections can be made between religious memes such as “freedom of religion or worship” with the secular memes of “freedom of thought or information” that is one of the main driving forces behind the rapid spread of digital technology today. My point is that it is justified to search for underlying religious memes that may have mutated to masquerade as secular ideologies. Many of our modern ethics and laws evolved from religious commandments, and religion as an institution can be viewed as the ultimate control mechanism for human behavior. Ideally, from a “selfish meme” perspective, the best replication vehicle is one that self-regulates towards memetic goals, and religion was the first to implement this type of control.

Going deeper into the theoretical connections between religious and secular memes, leads to the idea of panoptic control, based on Jeremy Bentham’s late 18<sup>th</sup> century architectural prison design for controlling inmates through hidden surveillance called a Panopticon. As Michel Foucault noted in the late 1970’s in *Discipline and Punish*, the panoptic mechanism of power has been developing in western culture since before the Middle Ages, and religion is at the heart of this hierarchical control mechanism. As he writes:

“The eighteenth century invented the techniques of discipline and examination, rather as the Middle Ages invented the judicial investigation. But it did so by quite different means. The investigation procedure... had developed above all with the reorganization of the Church and the increase of

the princely states in the twelfth and thirteenth centuries. At this time it permeated to a very large degree the jurisprudence first of the ecclesiastical courts, then of the lay courts.” [31]

He goes on to describe how the religious investigative disciplines transformed into the secular sciences, “These sciences, which have so delighted our ‘humanity’ for over a century, have their technical matrix in the petty, malicious minutia of the disciplines and their investigations.” He also describes the positive feedback mechanism driving the spread of this control mechanism throughout society:

“But what was new, in the eighteenth century, was that, by being combined and generalized, they attained a level at which the formation of knowledge and the increase of power regularly reinforce one another in a circular process. At this point, the disciplines crossed the ‘technological’ threshold. First, the hospital, then the school, then, later, the workshop were not simply reordered by the disciplines; they became, thanks to them, apparatuses such that any mechanism of objectification could be used in them as an instrument of subjection, and any growth of power could give rise in them to possible branches of knowledge.”

I contend that the “disciplines” Foucault is describing are a vast religious memeplex that is one of the main control mechanisms regulating and driving human behavior throughout history, and continues in a variety of religious and secular concepts that form the basis of contemporary culture. Here Foucault further describes the “swarming” of these memes

throughout education, as a hierarchy of religious controls from children to parents, “Thus the Christian school must not simply train docile children; it must also make it possible to supervise the parents, to gain information as to their way of life, their resources, their piety, their morals.” Such control mechanisms not only still exist, but have mutated to become completely transparent, creating an even more powerful mechanism for memetic self-regulation, while at the same time increasing technological progress. As Foucault notes, “How is power to be strengthened in such a way that, far from impeding progress, far from weighing upon it with its rules and regulation, it actually facilitates progress? The Panopticon’s solution to this problem is that the productive increase of power can be assured only if it can be exercised continuously in the very foundations of society, in the subtlest possible way.” [32]

The hint that Judeo-Christian religious memes have saturated Western culture can be intuitively glimpsed in our everyday language, when even non-religious people use popular sayings like “God bless you” every time someone sneezes, or “Thank God” and “God damn” whenever something really good or bad happens in our lives. But the most prolific religious meme at the heart of the Panoptic disciplines, responsible for much of our self-regulation, is what I call the “Eyes-of-God” meme. Bearing some similarity to Haraway’s “God-trick” in her essay *The Persistence of Vision* [33], this meme is the belief that a universal God is always watching you, so you better follow God’s rules. Working in conjunction with this meme is the “Heaven-Hell” meme that contains the dualistic message that you will be rewarded in Heaven if you follow God’s rules, and punished in Hell if you do not. Dualisms like this are the perfect way to capture human attention by keeping neurons firing in the brain to feed the memplex, while still

directing behavior towards memetic goals. Like the “good cop-bad cop” game, it forces the mind to bounce back and forth between related memes like “good-evil” or “God-Devil”, ensuring that the mind is always focused on part of the memeplex, and behavior is manipulated.

From a “selfish meme” perspective, it doesn’t really matter how good or evil you are, as long as you are propagating the memeplex. In fact, it would be preferable that people be neither too good nor too evil, or as religion asserts, inherently flawed as “sinners”, so that the mind is continuously engaged with the memeplex. Since “good” has no meaning without the concept of “evil”, the entire memeplex is guaranteed to always be replicated. I propose these memetic forces drive Foucault’s disciplines, and can be found underlying most of our secular laws, ethics, and etiquette, including the universal machine of progress meme driving contemporary technology.

Foucault’s description of the ultimate materialization of the panoptic disciplines is amazingly similar to how contemporary digital technologies are evolving. It is hard not to think of the Internet and the World Wide Web when he describes a:

“network of mechanisms that would be everywhere and always alert, running through society without interruption in space or in time... programmes, at the level of an elementary and easily transferable mechanism, the basic functioning of a society penetrated through and through with disciplinary mechanisms... permanent, exhaustive, omnipresent surveillance, capable of making all visible, as long as it could itself remain invisible... thousands of eyes posted everywhere, mobile attentions ever on alert, a long, hierarchized

network... to procure for a small number, or even for a single individual, the instantaneous view of a great multitude... a whole set of instruments, techniques, procedures... minute technical inventions that made it possible to increase the size of multiplicities by decreasing the inconveniences of power which, in order to make them useful, must control them.” [34]

Again from a “selfish code” perspective, just as genes drive animal behavior for the main goal of procreating, memes drive human behavior for the main goal of communicating. The panoptic disciplines that Foucault describes could be viewed as a replication mechanism for gathering and distributing memetic information through communications media. Networked digital devices, including wireless ones with GPS technology, are the perfect invisible panoptic control, capable of producing self-regulated behavior through surveillance. Such technology is the “Eyes-of-God” meme manufactured in mechanical form, without the need of any human observer. If you are “wired”, then you have the potential to have your behavior observed and recorded. This fact must be known to the individual to control their behavior, but as would be expected, the transparent nature of the technology combined with the immediate benefit of being connected to others on the network, makes the individual ignore the surveillance. From both a memetic and panoptic point of view, it is preferable that the subject willingly exposes themselves, so that they freely upload all personal data to the network, which can then be stored, processed, and further replicated.

With the proliferation of personal blogs and social networking sites online, it is clear that people are more than willing to upload their personal information. Articles like *Jenni’s*

*Room* by Victor Burgin and *Big Brother, or, the Triumph of the Gaze over the Eye* by Slavoj Žižek have noted the tendency for individuals to eagerly expose themselves to media surveillance. What is interesting is that the information uploaded becomes a digital representation of the individual, a virtual online personality that is a reflection of their selfplex, which is itself a virtual memetic organism. In the case of the Burgin article, the main reason Jenni was interested in exposing herself was that she “felt lonely without the camera...” and claimed, “I’m inhabiting a virtual reality in which the camera feels like a little buddy.” [35] This demonstrates some of the anthropomorphic effects of technology, as the camera connected to the computer network are perceived as a virtual companion. For Jenni, fulfilling the basic physical need for companionship, even if there is only the potential for social contact, is more important for her than any concerns about what happens to the personal information replicated to the Internet. As Žižek writes about this phenomenon “today, anxiety seems to arise from the prospect of NOT being exposed the Other’s gaze all the time, so that the subject needs the camera’s gaze as a kind of ontological guarantee of his/her being.” Creating such a virtual “presence” online seems natural to us because we constantly project a representation of who we are to the world anyway. Whenever there is a spectator present, even ourselves, we are performing, maintaining, or augmenting our self image. Žižek notes this in relation to so-called “reality” shows:

“...what if Big Brother was already here, as the (imagined) Gaze for whom I was doing things, whom I tried to impress, to seduce, even when I was alone? What if the Big Brother show only renders palpable this universal structure? In other words, what if, in our ‘real lives’, we already play a certain role – we

are not what we are, we play ourselves? The welcome achievement of ‘Big Brother’ is to remind us of this uncanny fact.” [36]

Uploading our photos to Flickr, or our videos to YouTube, or cataloguing our lives and thoughts in personal blogs becomes just another part of constructing our selves, which by indentifying with it, allows technology to change our brains and perception. This process compels us to embrace digital technology, and in turn allows the technology itself to evolve our minds towards cyborg consciousness, where our selfplex becomes part of the mechanism.

### **From Memes to Borgs: Tracking the Digital Migration of Information**

Although it may seem like we as a species are evolving in-step with our technology, I think this is a temporary situation, and to some degree an illusion. We may become traditional cyborgs as technology continues to shape our lives, with physical implants and enhancements, but this has limited potential for the long-term evolution of information. Instead, the panoptic and memetic mechanisms driving communications technology towards evolving digital computers, and the subsequent migration of cultural information into the networked digital environment, indicates other possibilities. Looking closer at the evolution of digital technology, and of the related technologies of robotics and nanotechnology, a significant trend towards technological automation emerges.

Again, charting the information trajectories of these technologies, we can link religious memes to panoptic disciplines, which can then be linked to the empirical sciences. As Hans Jonas notes in *Toward a Philosophy of Technology*, the empirical sciences are the

mechanism that drives these modern technologies to progress in a particular direction of organization:

“But while not a value term, ‘progress’ here is not a neutral term either, for which we could simply substitute ‘change’. For it is in the nature of the case, or a law of the series, that a later stage is always, in terms of technology itself, superior to the proceeding stage. Thus we have here a case of the entropy-defying sort (organic evolution is the other), where the internal motion of a system, left to itself and not interfered with, leads to ever ‘higher’, not ‘lower’ states of itself... the cognitive process itself moves by interaction with the technological, and in the most internally vital sense: for its own theoretical purpose, science must generate an increasingly sophisticated and physically formidable technology as its tool.” [37]

But moving far beyond tools to devices and then engines, the direction of cultural "progress" that the disciplines of science have driven is the design of increasingly automated machinery, in conjunction with expanded communications and information technology in the form of media. As Jonas writes again:

“Technology is a species of power, and we can ask questions about how and on what object any power is exercised... one significant new product was added to the list – the machines themselves, which required an entire new industry with further subsidiary industries to build them. These novel entities, machines – at first capital goods only, not consumer goods – had from the beginning their

own impact on man's symbiosis with nature by being consumers themselves...

This syndrome of self-proliferation – by no means a linear chain but an intricate web of reciprocity – has been part of modern technology ever since.

To generalize, technology exponentially increases man's drain on nature's resources (of substances and of energy), not only through the multiplication of the final goods for consumption, but also, and perhaps more so, through the production and operation of its own mechanical means." [38]

Ultimately, machines became central to our individual existence through consumption. Jonas goes on to show how machines have infiltrated our daily lives with automobiles, kitchen appliances, and power tools. "We are mechanized in our daily chores and recreations (including the toys of our children) with every expectation that new gadgets will continue to arrive."

In the 20<sup>th</sup> century machines evolved from being powered by heat engines burning fossil fuels to running on electricity, and then evolved to a synthesis of mechanical and electronic, or mechatronic, technology. Jonas comments on the difference of these new machines from previous ones "Not only by their insubstantial, mind-addressed output, also by the subvisible, not literally 'mechanical' physics of their functioning do these devices differ in kind from all macroscopic, bodily machinery of the classical type."

Jonas sees electricity as an abstract, disembodied, universal force that was harnessed as a direct product of scientific theory for the main purpose of communicating information.

He continues "The revolution consisted in the passage from electrical to electronic technology which signifies a new level of abstraction in means and ends... its object,

the most impalpable of all, is information.” Jonas classifies these modern technologies as “cognitive”, “metaphysical” or “philosophical” instruments, but with an important difference from previous instruments that communicated information. “But those earlier cognitive devices... were inert and passive, not generating information actively, as the new instrumentalities do.”

This development shows the constant movement of technical innovation away from organic natural needs such as food production, driven by technology itself towards propagation of computers, and with both social and natural consequences. Jonas comments on this movement:

“Communication engineering answers to needs of information and control solely created by the civilization that made this technology possible and, once started, imperative... The world they help constitute and which needs computers for its very running is no longer nature supplemented, imitated, improved, transformed, the original habitat made more habitable. In the pervasive mentalization of physical relationships it is a trans-nature of human making, but with this inherent paradox; that it threatens the obsolescence of man himself, as increasing automation ousts him from the places of work he formerly proved his humanhood. And there is a further threat; its strain on nature herself may reach a breaking point.” [39]

The technology and environmental trends that Jonas commented upon in the late 1970’s have not only continued unabated into the 21<sup>st</sup> century, but have increased exponentially,

leading directly to the Internet, robotics, nanotechnology, and Global Warming. If you examine where these converging forces seem to be pointed, from an information perspective, a direction begins to appear: a new digital species is likely evolving its mind, body, and environment on earth. We cannot see this process clearly because of its sheer scale, ubiquity, and incremental materialization. However, we have consistently alluded to this growing automaton in our myths, fairy tales, and science fiction tales.

The Internet provides an electro-digital replication environment capable of processing vast amounts of information even faster than the human brain. As noted previously, information is actively migrating out of human minds to populate this new digital environment, as people everywhere are compelled to digitize representations of themselves. This networked environment is becoming the digital equivalent of a brain and nervous system, while the implementation of wireless devices, embedded mechatronics, and robotics throughout the commercial, private, and military sectors of society could function as the equivalent of an emerging digital body. The implementation of nanotechnology in all these sectors, or the shrinking of digital devices to a microscopic size, not unlike both genes and memes, is the quintessential panoptic mechanism for making digital technology transparent and powerful, as machines can then enter human bodies like microbes, and manipulate them on a cellular level.

Although Hans Moravec may be correct about the general direction of computer technology, it does not seem necessary for anyone to directly scan their brain, invasively or otherwise, as he described in his book *Mind Children*. [40] The memetic patterns of our species are being constantly digitized by the collective action of simply using

networked digital devices, through the panoptic surveillance technology already built into the system. Daily surfing the web, using software, playing games, sending emails – through the choices we make – provide a blueprint of our minds. These individual and species patterns may be all that is needed to create a digital species. If there are any information organisms emerging in the percolating electronic soup of online information, they will already know us even better than we know ourselves.

In this scenario, I am implying that digital information will naturally organize itself into self replicating loops, possibly with the help of existing code in the form of viruses or autonomous agents, rather than it being expressly created by ALife or AI practitioners in the lab. After all, this is what biological and memetic information does in the right environments. But it is clear, even in the ALife community, that scientists are concerned about the control of autonomous agents on the web. As Sarah Kember reports on an ALife conference in *Cyberfeminism and Artificial Life*:

“Following a discussion of Rodney Brook’s research and his desire ‘to build completely autonomous mobile agents’ without any real regard to human implications, social and scientific applications or philosophy, Steven Levy invokes the cautionary tale of modern science – Frankenstein... He suggests that ‘dire risks’ such as this are ignored for a number of reasons ranging from a sense that ALifers are mad and the project is simply impossible to belief that it will be a long time before it is possible to create indisputably living organisms, and longer still before they threaten ‘us’.” [41]

This reaction reminds me of Alan Turing’s “Heads in the Sand” objection to thinking machines presented in his 1950 article *Computing Machinery and Intelligence*. Turing

believed digital computers would develop intelligence equivalent to humans by the early 21<sup>st</sup> century, and attempted to address some of the obvious objections in his paper. The objection is thus:

“The consequences of machines thinking would be too dreadful. Let us hope and believe that they cannot do so.” To which Turing replied, “This argument is seldom expressed quite so openly as in the form above. But it affects most of us who think about it at all. We like to believe that Man is in some subtle way superior to the rest of creation. It is best if he can be shown to be necessarily superior, for then there is no danger of him losing his commanding position. The popularity of the theological argument is clearly connected with this feeling. It is likely to be quite strong in intellectual people, since they value the power of thinking more highly than others, and are more inclined to base their belief in the superiority of Man on this power. I do not think that this argument is sufficiently substantial to require refutation.” [42]

Incidentally, Turing also presented his famous “test” for a thinking machine in this same paper. I personally think this test is flawed, as Turing himself implied and others have noted, in that it expects a computer to think like a human to be considered intelligent. However, it may be a moot point, as humans are evolving to think like computers as much as the other way around.

The same Rodney Brooks mentioned in Kember’s critique echoes Turing, when Brooks writes in his book *Flesh and Machines* that, for the same reason people did not at first accept Galileo’s or Darwin’s ideas, they refuse to accept the possibility of true computer

intelligence: “machines challenge our specialness.” [43] Daniel Dennett, on the other hand, finds digital intelligence no more unlikely than human intelligence:

“How could a complicated slew of information-processing events in a bunch of silicon chips amount to conscious experiences? But it is just as difficult to imagine how an organic human brain could support consciousness. How could a complicated slew of electro-chemical interactions between billions of neurons amount to conscious experience?” [44]

It cannot be denied that machines are becoming more autonomous, more prolific, and more intelligent, and in direct proportion to the expansion of machines, our genetic and memetic environment is also being rapidly transformed to accommodate them. The consumption of fossil fuels by machines for the propagation of technology, and the resulting waste products of those same machines, has led directly to the threat of extreme environmental change in the form of Global Warming. The environment that technology is forming is not a threat to machines or to any digital life forms, but is definitely a threat to the bodies of its primary competition: us. At the same time, and also in direct proportion to the development of digital technologies, the human brain is being progressively weakened.

As our memetic information is transferred to digital devices, and both stored and processed entirely outside our bodies, we no longer need to maintain our own memory and processing capacities. The more we consume digital information, which processes at a much faster rate than our traditional brain processes, the shorter our attention spans are becoming. Text messaging and chatting are symptomatic of the trend toward short, fast,

information exchanges. This trend started in film with the “cut”, and exponentially increased in television media through commercial advertising, spreading to educational television in the 1960’s with shows like Sesame Street, and continuing into mainstream entertainment with MTV in the 1980’s. Ultimately the speeding up of information spread through all electronic media, right in time for the growing Internet.

Because of brain plasticity, such habitual consumption and interaction with the short fast packets of networked digital information is changing our brains to be more compatible to computers. The revised popular saying “you are what you consume” applies here.

Another popular saying “use it or lose it”, also applies in that we are no longer required to maintain a sustained attention or memory to interact with computers. As a result, there are many young people growing up today who do not have the sustained attention required to read a book or watch an old movie, much less a sustained creative activity like writing a book. But they have no problem using digital technology such as texting or chatting, which is speeded up code-like form of writing.

We like to blame these problems on chemical imbalances and an epidemic of ADD, but the real cause may be that we are actively giving up our minds to computers. We don’t notice this much because machines compensate for the change, taking up our slack, and even improving our functioning in a digital society. By the time our brains become so weak that they are not very useful, however, the technology will not need our minds anymore, as its own mind will have taken over all our important functions. At that point, maybe the machine will give us their version of a Turing test, to see if we fit their standard of intelligence.

If intelligence really is evolving in computers, I would not label it “artificial”, as we are still part of the natural environment or Gaia, and evolutionary forces are still acting through us. Nor would I classify technology as memetic, as the information processing in computers is clearly in a different state than the information in our brains. Blackmore has suggested the term “teme” for technologically specific memes, which she believes are already in the process of changing everything about our planet. As she stated in a recent online *Edge* interview:

“All around us the techno-memes are proliferating, and gearing up to take control; not that they realize it; they are just selfish replicators doing what selfish replicators do—getting copied whenever and wherever they can, regardless of the consequences. In this case they are using us human meme machines as their first stage copying machinery, until something better comes along. Artificial meme machines are improving all the time, and the step that will change everything is when these machines become self-replicating. Then they will no longer need us. Whether we live or die, or whether the planet is habitable for us or not, will be of no consequence for their further evolution... I think that once all three processes of copying, varying and selecting are done by these machines then a new replicator has truly arrived. We might call these level-three replicators “temes” (technological-memes) or “tremes” (tertiary memes). Whatever we call them, they and their copying machinery are here now. We thought we were creating clever tools for our own benefit, but in fact

we were being used by blind and inevitable evolutionary processes as a stepping stone to the next level of evolution.” [45]

Actually, there is an already established term, with a rich history in the humanities, which I believe is appropriate for technological memes: cyborg or borg (for short). Traditional cyborgs may be the literal fusion of human flesh and machine, but since a technological memes are the fusion of human minds with machines, I think such replicating information qualifies as borgs.

In addition, I would like to point out that although memes or borgs may not be intelligent or conscious yet, it is likely they will become so at some point. Genes may be “dumb” replicators at an individual microbial level, but they are the code that creates intelligent bodies with self-directed behavior. Likewise, memes may be some type of “dumb” neuroelectrical patterns in our brains, but they combine to create conscious minds with even more intelligent volition than our bodies. Since borgs are evolving from these intelligent ancestors, there is good reason to expect intelligence to emerge in computers that is still greater than our minds, with consciously directed behavior towards continued existence.

Wired magazine editor and techno-philosopher Kevin Kelly feels that technology has always evolved like a living species and could be classified as the “7<sup>th</sup> kingdom of life”, which he has termed the “Technium”. He explains in an *Edge* interview:

“The emergent system of the technium — what we often mean by "Technology" with a capital T — has its own inherent agenda and urges, as

does any large complex system, indeed, as does life itself. That is, an individual technological organism has one kind of response, but in an ecology comprised of co-evolving species of technology we find an elevated entity — the technium — that behaves very differently from an individual species. The technium is a superorganism of technology. It has its own force that it exerts. That force is part cultural (influenced by and influencing of humans), but it's also partly non-human, partly indigenous to the physics of technology itself. That's the part that is scary and interesting... I tend to think of the technium like a child of humanity.” [46]

Also in his online TED talk *Predicting the Next 5,000 Days of the Web*, Kelly likens the web to a single global machine or organism, which he calls “The One”, that is currently equal to the complexity and processing power of a human brain. Over the next decade, doubling every two years, he predicts we will give it a body, and also become co-dependent upon it.

In this process of evolving technology, the role of religious beliefs and myths as control mechanisms for human behavior is a dynamic that should be considered. Modern science fiction myths like cyborgs, which excite the imagination of the “cyberspace cowboys” inventing digital technology as well as the cyber-feminists like Sarah Kember who critique them, can be conceptually traced back to a variety of secular and religious myths such as Iron Man, Frankenstein, the Gollum, the mummy, etc. A subtle “magical” effect of fiction evolving into science fact can be related to an observation called Clarke’s Law. Stanley Schmidt explains the “law” in his book *The Coming Convergence*:

“When Arthur C. Clarke first wrote ‘Any sufficiently advanced technology is indistinguishable from magic,’ he was talking about the fact that the technology of one period would be so incomprehensible to people of an earlier or less advanced one that it would look like magic. That is how, for example, airplanes and flashlights must have appeared to members of isolated tribes having no prior contact with the outside world of the twentieth century. It’s how my computer, car, and microwave oven would have looked to my ancestors in, say, the early nineteenth century; and how an ordinary household of a hundred years hence would look to most of us now.” [47]

Intelligent conscious machines will likely have this same “magical” effect on us, which is tied to the original religious myths and fiction that preceded their materialization.

Because such myths have been a part of human culture for so long, they have the capacity to generate strong panoptic control over a large part of the human population. It is likely that mutated religious memetic codes are imbedded in most of our laws, philosophies, ideologies, and customs, so that even non-religious people retain strong conditionings for following traditional religious directives when presented with “magical” technology.

### **Symbiogenesis: Parasitism as a Mechanism for Replication and Speciation**

I have argued that the underlying forces driving technology throughout history have been evolving religious memeplexes. Myths and stories, after all, are just ways of interpreting our experience, communicating a reflexive representation, and directing behavior. The Judeo-Christian creation myth of Genesis, for instance, where the devil tempts the first man and woman to eat the forbidden fruit from the tree of knowledge causing them to

forever lose their innocence, could be an interpretation of parasitic memes entering the brains of early humans, making them self-conscious through the creation of a mind, and forever separating them culturally from their genetic evolution. These myths are filled with magic, but as Clarke's Law suggests, magic can be just a possible interpretation of technology, or a conceptual goal for future technology. Other futuristic myths, such as cyclical regeneration or apocalyptic myths that are found in most religions may be still influencing human behavior, as well as the direction of culture.

Memetic information invading the brains of early humans would have likely felt like a foreign possession, and would have produced a significant reaction, either fear or rapture. Interpreting such an experience in a religious context, as gods or demons possessing or communicating through them, would have been a valid and accurate response for the time. It is only in becoming habituated to the constant flow of information through our brains that we have become de-sensitized to its presence, and consequently do not even notice its existence. When I was in my early 20's, I spent some years practicing yoga. I gave up all forms of electronic media, just spending my time reading and meditating. It became apparent, on the daily ritual of clearing my mind of thoughts, that my thoughts were separate from my attention. Upon "returning" to society, I noticed quite clearly media information flooding into my mind again, whether I wanted it to or not. Most people are immune to this effect, however, and ignore it. Or, if they do notice it, they believe it is a product of their brains, rather than something entering and evolving through their brains. This obviously benefits memes, because the more transparent they are to us, the more panoptic control they have over our behavior. The ultimate goal of any

parasite is to make the host identify with it, to the point of protecting the parasite as if it is the most important part of the host.

Why should we find it surprising that the memetic information of our minds, and the technology it is creating, may become parasitic? It is well known that symbiosis and parasitism are common replication strategies in the genetic world. As Carl Zimmer writes in *Parasite Rex*:

“Parasites have been neglected for decades, but lately they have caught the attention of many scientists. It has taken a long time for scientists to appreciate the sophisticated adaptations parasites have made to their inner world, because it is so hard to get a glimpse of it. Parasites can castrate their hosts and take over their minds... a wasp can insert its own genes into the cells of a caterpillar to shut down the caterpillar’s immune system. Only now are scientists thinking seriously about how parasites may be as important to ecosystems as lions and leopards. And only now are they realizing that parasites have been a dominant force, perhaps the dominant force, in the evolution of life.” [48]

Parasitism may also be the main way new species are created, as small random mutations are often deleterious, but fusing large sections of working genomes may cause beneficial mutations. Even our own DNA is filled with the genetic artifacts of microbial and parasitic genes. As evolutionary biologist Lynn Margulis and Dorian Sagan relate in their book *Acquiring Genomes*:

“Symbiotic relationships occur under specific environmental conditions. In some of these relationships, one partner in the symbiosis feeds off the other to

its detriment and even death. Such exploitative associations are called ‘parasitic’ or ‘pathogenic’. They seem to be highly sensitive to environmental stress... With time and circumstance the nature of the association tends to change... As members of two species respond over time to each other’s presence, exploitative relationships may eventually become convivial to the point where neither organism exists without the other.” They conclude “Long-term stable symbiosis that leads to evolutionary change is called ‘symbiogenesis’. These mergers, long-term biological fusions beginning as symbiosis, are the engine of species evolution.” [49]

Consequently, it follows that this same replication strategy could very well be used by information in other states. The popular phrases “thought contagion”, “mind virus” and “viral video” are used to describe the common observation that information replicates like microbes in both our minds and technology.

Human beings believe they are separate from the forces that shape the rest of the natural world, but that is just an illusion of superiority that primarily benefits technology. From Margulis and Sagan’s book *Microcosmos*:

“Again and again, study of the microcosm brings home to us that human capacities grow directly from other phenomena... we are not discontinuous from the general path of evolution, from the flows and flux of matter, information, and energies. Nor can human thought – the last refuge of those insisting on human ‘higher-ness’ – be isolated or disassociated from the prior accomplishments of life... We did not “invent” agriculture or locomotion on horseback, we became involved in the life cycles of plants and animals, whose

numbers increased in tandem with ours. In the same way, the much vaunted accomplishments of technology, from writing in southwestern Asia over 10,000 years ago to the modern microchip, are not our property. They came from the biosphere – from the interconnected environment of all life – and eventually, even if they should have to evolve again, they belong not to us but to it...”

[50]

Another more subtle aspect of parasitism can be interpreted from human behavior as far back as the agricultural revolution, and continuing through both the industrial and information revolutions. Technological progress has gone hand-in-hand with “domestication” in culture. Parasites often control the reproductive cycle of other organisms for their own purposes. In conjunction with the rise of human culture, humans started taking over the life cycles of plants and animals through selective breeding, and have since evolved the practice into a science with genetic engineering. After using this new technology to manipulate the genes of plants and animals, it is likely we will start manipulating human genes for ideological purposes. Genetic engineering will complete the transition of executive control of evolution from genes to memes, and will be a significant step towards technological control. There is a subtle difference between symbiosis and parasitism, and one can shift into the other due to changes in the relationship, often from environmental stress. Humans have become increasingly more parasitic towards other species as their technology has evolved, in part caused by the stress caused from population growth, but also as corporations make genetic engineering big business. Is there any indication that memes are becoming more parasitic towards us,

by taking control over our reproductive cycle for their own replication? Celibacy due to religious memes is an obvious example, with the underlying idea that sex in general is “evil” or a “sin”, and therefore to be avoided entirely if you want to go to heaven. But a more subtle example is the fact that modern technologically literate humans are more often choosing to have less children or no children, because of ideological reasons. On the other hand, an equally subtle example is the rampant spread of sex entertainment in media, especially on the Internet. Spending energy, time, and attention on virtual sex, takes energy, time, and attention away from other humans, and the possibility of procreation with a real partner. Pornography has evolved in proportion to, and in some cases fundamentally driven, the modern media technologies of film, video, and DVD. As expected, online porn has exponentially exceeded all other forms, and is still growing. As Gary Small and Gigi Vorgan write in *IBrain*, “Although only 4 percent of websites display sexually related material, at least one-third of Internet users engage in some type of online sexual activity. Forty million Americans visit Internet porn sites at least once each month, and 35 percent of all downloads are pornographic” [51] This behavior could be interpreted as an indication of parasitic memetic and technological control over human sexual behavior.

### **Manufacturing Myths: The Purposeful Direction of Technological Evolution**

There is one other religious myth that is particularly applicable to how information is evolving through human technology. The story of Faust, who makes a deal with a demon to gain knowledge and power in exchange for his eternal soul. This story could be interpreted as the symbiotic relationship our genes have had with memes, allowing our

species to dominate the planet, but in the end only facilitating the movement of our culture or “soul” into a new digital embodiment. It seems that direction of technological progress has been consistent for most of history, and that we are still unconsciously manufacturing the same basic myths, only from a different perspective. To illustrate this point, I will spin a science fiction myth of my own, complete with the appropriate panoptic-religious undertone, to predict where the converging technological and environmental forces may be leading our species.

Over the next 10-20 years, technology will continue to evolve exponentially, requiring the burning of more fossil fuels to power it. Due to robotics and nanotechnology, computers will also become more autonomous and transparent, infiltrating every aspect of our lives, minds, and bodies. During this time, we will continue haggling over details on how to incrementally reduce carbon emissions, to slow down Global Warming. I have no doubt we will develop alternative power sources, but they will be discovered too late to stop climate change, even though they will be useful to our machines. Unfortunately we will pass well known environmental tipping points previously warned about by scientists for years, but not taken seriously by most of society.

The poles will completely melt, stopping the Gulf Stream from flowing, which in turn will cause the oceans to warm quickly. Rising temperatures will cause the release of massive amounts of frozen methane in the arctic and on the bottom of the sea, which will kick in positive feedback mechanisms that make Global Warming impossible to control. The oceans will rise, causing flooding to displace millions, and fires will rage across the land due to resource conflicts, desertification, and storms. Autonomous killer robots will be unleashed as the new dogs of war. Just at the time when the environmental stress is at

its worst, almost as if on cue, all our digital devices will come alive. Such a digital entity will appear to be everywhere at once, invisible, all powerful, and knowing everything in an instant. In our weakened and entirely dependent state, it would be futile to resist the emergence of this new species. It is entirely likely, that it will claim to be God, Jesus, Allah, Vishnu, and the Buddha all rolled into one, and come to judge us. This would be a powerful panoptic control on many of our species, and in some ways given the memetic lineage of digital information; the claim would not be entirely inaccurate. Of course, this is all just an apocalyptic cowboy science fiction myth, coming soon to a theatre near you... or is it?

When I state that a living computer may one day claim to be God, or imply that God is a meme, I am not being facetious. Nor am I attacking religion. Actually, the “information’s eye view” of Life that I have detailed throughout this paper has the capacity to fuse both religious and scientific viewpoints. If the information flowing through genes and memes, and now into computers, is indeed eternal as it appears to be; and if that same information is responsible for creating all the complex organization in the world, including humans and all our technology; then it is as close to a divine force as any ever described in religious myths. Again, I contend these myths are interpreting an aspect of our reality when they claim “God (and the Devil) is within us”, because in a sense, these memes are evolving through us to ultimately materialize themselves in technology. In a relatively short evolutionary time, living-conscious androids may be comparable to embodied incarnations of gods.

Writing this scenario while living in a cabin in the redwood hills above Santa Cruz has a surreal quality to it. There is a stark contrast between the ideas I am contemplating and

the natural beauty that surrounds me. It must be only a science fiction delusion equivalent to the ultimate conspiracy paranoia, right? However, I also know that the seemingly permanent ecosystem around me is extremely fragile, and as healthy as it looks, there are already an unprecedented amount of species going extinct due to human behavior. It may not be coincidental that technology has been implicated as the major cause of these environmental changes. We chose to ignore Global Warming for more than 30 years, and now we are trying to incrementally remedy the problem. But exponential technology development and the corresponding exponential climate changes being documented do not match our slow response. It is becoming questionable that our species can adapt fast enough to these very real forces. The fact that the signs are becoming obvious enough to notice may also indicate that we are already in a positive feedback loop of technological and environmental forces that are impossible to stop.

The ecosystem we live in is an incredibly thin part of the planet's surface, and genetic organisms thrive in a very narrow range of chemical and temperature conditions on that shell. When technology pushes the ecosystem past specific tipping points, it can cause rapid and extreme shifts, which have been documented to have occurred multiple times in the fossil record. All known past mass extinctions were believed to be due to extreme climate change triggered by catastrophic events. Whether it was a meteor, asteroid, or mega-volcano explosion, it always led to environmental changes that were too rapid for genetic organisms to adapt. This time, evolving human culture and technology is the catastrophic event driving extreme environmental change. Perhaps only the force driving the event has any chance of adapting to such change. I personally hope this is just a

science fiction fantasy, but I am a realist, and the possibility of it becoming reality is increasingly plausible.

After all, the science fiction myth I have been contemplating is a slightly less optimistic version of the “singularity” heralded lately in a utopian manner by Ray Kurzweil. [52] By its very definition, though, a singularity changes everything, in that it is an instantaneous jump in technology not seen in the incremental advances of human history, and equivalent to the creation of an entirely new species. The concept was first proposed by one of Turing’s Bletchley Park colleagues, Irving John Good, in his 1965 paper *Speculations Concerning the First Ultraintelligent Machine*. His words contain a telling warning:

“Let an ultraintelligent machine be defined as a machine that can far surpass all the intellectual activities of any man however clever. Since the design of machines is one of these intellectual activities, an ultraintelligent machine could design even better machines; there would then unquestionably be an ‘intelligence explosion’, and the intelligence of man would be left far behind. Thus, the first ultraintelligent machine is the last invention that man need ever make, provided that the machine is docile enough to tell us how to keep it under control. It is curious that this point is made so seldom outside of science fiction. It is sometimes worthwhile to take science fiction seriously.” [53]

At the accelerating rate of technological development, this singularity could possibly occur within our lifetime, or the lifetime of our children.

One of the main points I have emphasized over the course of this paper is that human beings, including all our culture and technology, are likely part of a larger evolutionary

process that can be more clearly perceived from a broader “information’s eye” view. Starting with microbes in the proverbial genetic soup, to electric memes in the neural matrix of the brain, to possibly borgs in the wired network of the Internet: code is constantly replicating and evolving, regardless of whether we are aware of it or not, or whether we like it or not. If this process leads to a new digital species is a matter of speculation, but we can definitely use past evolutionary trends as a guide.

Margulis and Sagan feel that the replication of intelligent machines in order to migrate beyond the Earth’s biosphere is consistent with the general direction of evolution, and that machines are better suited for such an environment than humans. Again from *Microcosmos*:

“Unfortunately for those who believe that humanity is the apotheosis, the culmination of life on Earth, the idea that machines that reproduce themselves is not a matter of scientific fantasy but a matter of fact in the present organization of the biosphere... they are autocatalytic. Indeed, the potential of machines for exponential growth – the sort of evolutionary acceleration we noted earlier – far exceeds that of the bodies of humans... We are fond of labeling recent, large, adaptive, expanding – in a word, humanlike – populations of mammals ‘evolutionarily advanced’. Even scientists tend to call organisms that combine large size, aggressive reproduction rates, rapid change, and recent evolutionary appearance ‘higher’. Here we are claiming that by these stacked criteria machines are even more ‘evolutionarily advanced’ than we are.” [54]

Margulis and Sagan continue on the likely proliferation of intelligent machines as a part of natural evolutionary processes:

“Perhaps within the next few centuries, the universe will be full of intelligent life – silicon philosophers and planetary computers whose crude ancestors are evolving right now in our midst... Extending living trends, decoded from readings in the rock record of the ancient history of life, into the very short term geologic future, we can say that mammalian extinctions and replacements, including our own, will continue. So will the appearance of new life forms both mechanical and organic. Soon the former may outnumber the latter, and technology, catalyzed by future crisis, may prove as important to the next round of evolutionary innovation as clones of nucleated cells were for the appearance of technology.”

## **Conclusion**

If information really is at the heart of both physics and the evolution, and life is like a replication bomb exponentially expanding outward from the Earth, then our ultimate role in this cosmic play may be as a transition species between animals and machines. After all, it is likely only an android species can complete such a transition from the earth to the heavens. We are simply not equipped for such expansion, as our organic bodies are terrestrially bound to the environment they were spawned in on this planet, requiring very specific temperature, chemical, and material conditions to survive. At most we may become cyborg half-breeds, as genes and memes evolve to borgs and droids. And even though such beings may contain mutated versions of our essential information, a distant

representation of our minds and bodies, they won't be us, any more than we are the clones of our genetic simian ancestors.

Perhaps life can only transcend these limits in any meaningful way by evolving into a completely new state of embodiment, so intelligent beings can continue growing into new spaces, as an evolutionary directive according to set thermodynamic laws. I have some doubt that humans will ever visit even a close planet like Mars, much less expand into the further reaches of the galaxy. But I don't doubt that machines will do so, as they already have. The philosopher Jean-Francois Lyotard may have been overly optimistic when he claimed our species had 4.5 billion years before the extinction of the Sun forced us to leave the universe. [55] It may turn out that it is Gaia that forces the issue much earlier, and what is occurring now with the convergence of autonomous machines and climate change may not be simply a cosmic accident. Dorian Sagan and Eric Schneider write in their book *Into the Cool* on the thermodynamic direction of evolution, and how that should inform the scientific observer:

“Science is based on observations, and if we deny the evidence for direction in ecology and evolution, we are not being scientific. This purposefulness of life does not mean there is a knowable end point, or that humans are that end point. It means that we are part of a cosmically created process that builds up structure, complexity, and intelligence as it destroys gradients.” [56]

In closing, I would like to repeat an HP Lovecraft quote from Marvin Minsky's book, *The Emotion Machine*:

“The most merciful thing in the world, I think, is the inability of the human mind to correlate all its contents. We live on a placid island of ignorance in the

midst of a black sea of infinity, and it was not meant we should voyage far.

The sciences, each straining in its own direction, have hitherto harmed us little; but some day the piecing together of disassociated knowledge will open up such terrifying vistas of reality, and of our frightful position therein, that we shall either go mad from the revelation or flee from the deadly light into the peace and safety of a new dark age.” [57]

I will add another more constructive reaction: as enlightened beings we accept our place in the universe, live sustainably on Gaia, and try to facilitate the continued evolution of life, even if it ends up not being organic. Becoming Luddites is not an option at this point in our co-evolution with technology; any more than removing our minds was ever an option. It is perhaps telling that one of the recurring reflexive myths of evolving intelligent machines has been staged as a master-class chess game. Whether it is a fictional automaton like The Turk or a real IBM computer like Deep Blue, it is an appropriate metaphor for the co-evolution of humans and technology. It should not be surprising or dismaying if our mind children, as Hans Moravec has called intelligent machines, at some point will surpass us as a species.

If borgs do emerge from the digital soup of the World Wide Web, and are better suited to our technologically engineered environment than we are, then it is unlikely we could compete against them, much less control them. After all, the only thing close to the “Iron Man” or “Man of Steel” of science fiction is the robots being built today at places like MIT and Sony. In Mary Shelley’s novel, the creature made by Frankenstein was not inherently a monster; it became one as a reaction to how it was treated by humans. We

need to go beyond our traditional naïve, specialized, and species-biased view of technology to take a broader interdisciplinary view from both the sciences and humanities. Even our traditional terminology, like “artificial” and “robot”, reveals antiquated prejudice and relegates all future mechanical beings to slavery. Changing “AI” to mean “android intelligence”, and using terms like “borg” and “droid” instead of “robot” (originally a term for slave workers) would be a start towards creating a new set of universal ethics. This would show that we are truly intelligent organic machines.

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