

THE ARTILECT WAR

Cosmists vs. Terrans

**A Bitter Controversy Concerning Whether Humanity Should
Build Godlike Massively Intelligent Machines**

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Abstract.

[This paper](#) claims that the “species dominance” issue will dominate our global politics later this century. Humanity will be bitterly divided over the question whether to build godlike, massively intelligent machines, called “artilects” (artificial intellects) which with 21st century technologies will have mental capacities trillions of trillions of times above the human level. Humanity will split into 3 major camps, the “Cosmists” (in favor of building artilects), the “Terrans” (opposed to building artilects), and the “Cyborgs” (who want to become artilects themselves by

adding components to their own human brains). A major “artilect war” between the Cosmists and the Terrans, late in the 21st century will kill not millions but billions of people.

1. Introduction

This paper claims that the “species dominance” issue will dominate our global politics this century, resulting in a major war that will kill billions of people. The issue is whether humanity should build godlike, massively intelligent machines called “artilects” (artificial intellects), which 21st century technologies will make possible, that will have mental capacities trillions of trillions of times above the human level. Society will split into two (arguably three) major philosophical groups, murderously opposed to each other. The first group is the “Cosmists” (based on the word Cosmos) who are in favor of building artilects. The second group is the “Terrans” (based on the word Terra, the earth) who are opposed to building artilects, and the third group is the “Cyborgs”, who want to become artilects themselves by adding artilectual components to their own human brains.

2. 21st Century Artilect Enabling Technologies

2.1. Moore’s Law

Gordon Moore, cofounder of the microprocessor company Intel, noticed in 1965 that the number of transistors on an integrated circuit (chip) was doubling every year or two. This trend has remained valid for over 40 years, and it is thought that it will remain valid for another 15 years or so, until transistors reach atomic size.

2.2. 1 bit/atom by 2020

Extrapolating Moore's Law down to storing one bit of information on a single atom by about 2020, means that a handheld object will be able to store a trillion trillion bits of information. Such a device is called an "Avogadro Machine (AM)".

2.3. Femto-Second Switching

An Avogadro Machine can switch the state of a single atom ($0 \Leftrightarrow 1$) in a femtosecond, i.e. a quadrillionth of a second (10⁻¹⁵ sec.), so that the total processing speed of an AM is roughly 10⁴⁰ bits per second.

2.4. Reversible Computing

If computing technology continues to use its traditional irreversible computational style, the heat generated in atomic scale circuits will be so great, they will explode, so a reversible, information preserving, computing style will be needed, usually called "reversible computing", that does not generate heat, hence will allow 3D computing, and no limit to size. Artifacts can become the size of asteroids, kilometers across, with vast computing capacities.

2.5. Nanotech(nology)

Nanotech (i.e. molecular scale engineering) will allow AMs to be built. Nanotech will thus allow artefacts to be built, once we know how to build brain like circuits. Nanotech is the “enabling technology” for artefact building.

2.6. Artificial Embryology

One of the greatest challenges of 21st century biology is to understand “development”, i.e. the embryogenic process, i.e. how a fertilized single cell grows into a 100 trillion cell animal such as ourselves. Once this process is well understood, technology will be able to create an artificial embryology, to manufacture products, hence “embryofacture” (embryological manufacture). Embryofacture will be used to build 3D complex artefacts.

2.7. Evolutionary Engineering

The complexities of artefact building will be so great (e.g. the human brain has a quadrillion (10^{15}) synapses (connections between neurons in the brain)), that an evolutionary engineering approach will be needed, which applies a “Genetic Algorithm” approach to engineering products. Artefacts will be built using this technique.

2.8. (Topological) Quantum Computing

Quantum computing is potentially exponentially more powerful than classical computing. It can compute 2^N things at a time, compared to classical computing’s 1 thing at a time, where N is the number of (qu)bits in the register

of the quantum computer. Topological quantum computers (TQCs) store and manipulate the qubits in topological quantum fields, and are thus robust against noise. TQC will soon make quantum computers practical. Artefacts will be TQC devices.

2.9. Nanotech Impact on Brain Science

Today's top supercomputers are close to reaching the estimated bit processing rate of the human brain, (i.e. about 10^{16} bits per second), but they are far from being intelligent by human standards. What is needed to make them humanly intelligent is knowledge from the neurosciences on how the human brain uses its brain circuits to perform intelligent tasks. Nanotech will furnish neuroscience with powerful new tools to discover how the brain works. This knowledge will be quickly incorporated into the building of artefacts.

2.10. Artificial Brains

The above technologies will result in the creation of an artificial brain industry and the creation of rival national brain building institutions and projects equivalent to NASA and ESA for space travel. In time, the brain building industry will become the world's largest.

3. The Artefact : Capacities 10^{24} Times Above Human Levels

As stated in the above section, the estimated bit processing rate of the human brain is approximately 10^{16} bit flips per second. This figure is derived from the fact that the human brain has about 100 billion neurons (10^{11}), with each neuron synapsing (connecting) with roughly ten thousand other neurons (10^4), hence there are a quadrillion synapses, each signaling at a maximum rate of about 10 bits per second.

Thus the human bit processing rate is $10^{11+4+1} = 10^{16}$ bits per second. As mentioned in the previous section, a hand held artifact could flip at 10^{40} bits per second. An asteroid sized artifact could flip at 10^{52} bits a second. Thus the raw bit processing rate of the artifact could be a trillion trillion trillion (10^{36}) times greater than the human brain. If the artifact can be made intelligent, using neuroscience principles, it could be made to be truly godlike, massively intelligent and immortal.

4. The Species Dominance Debate Starts

The “species dominance” debate has already started, at least in the English speaking countries and China. The fundamental question is whether humanity should build artifacts or not. This issue will dominate our global politics this century, and may lead to a major war killing billions of people.

As the artificial brain based products (e.g. genuinely useful household robots) become smarter every year, people will

be asking questions such as “Will the robots become as smart as us?” “Will they become smarter than us?” “Should humanity place an upper limit on robot and artificial brain intelligence?” “Can the rise of artificial intelligence be stopped?” “If not, then what are the consequences for human survival if we become the Number 2 species?” The question “Should humanity build godlike, massively intelligent artifacts?” is the most important of the 21st century, and will dominate our century’s global politics. It is the equivalent of the question which dominated 19th and 20th century global politics, i.e. “Who should own capital?” which led to the rise of the Capitalist-Communist dichotomy and the cold war.

5. Cosmists, Terrans, Cyborgs

As the species dominance debate begins to heat up, humanity will split into two (possibly three) major philosophical groups, namely –

- a) The ***Cosmists*** (based on the word Cosmos). Cosmist ideology is in favor of building artifacts. (See section 6 for arguments in favor of Cosmism).
- b) The ***Terrans*** (based on the word Terra = the earth). Terran ideology is opposed to building artifacts. (See section 7 for arguments in favor of Terranism).
- c) The ***Cyborgs*** (based on the words “cybernetic organism” = part machine, part human). Cyborgs want to become artifacts themselves by adding artificial

components to their own brains. (See section 8 for arguments in favor of Cyborgism).

The dispute between the Cosmists and the Terrans will be so bitter that a major war is likely in the second half of the century.

6. Arguments of the Cosmists

6.1. “Big Picture” Argument

Human beings live a puny 80 years in a universe billions of years old, that contains a trillion trillion stars. The cosmos is the “big picture”. Cosmists want artefacts to become a part of that big picture, understanding it, traveling thru it, manipulating it, etc., hence the name of the ideology “Cosmism”. The preoccupations of human beings seem pathetic in comparison.

6.2. Scientific Religion

Most Cosmists are not religious, viewing traditional religions as superstitions invented thousand of years ago before the rise of science. But as humans they feel the pangs of religious impulse. Such impulses could be satisfied by Cosmism, a “scientist’s religion” due to its awe, its grandeur, its energizing, its vision.

6.3. Building Artefact Gods

The primary aim of the Cosmists will be to build artefacts. It will be a kind of religion to them, the next step up the

evolutionary ladder, the “destiny of the human species to serve as the stepping stone to the creation of a higher form of being”. In building artifacts, the Cosmists will feel they are building gods.

6.4. Human Striving, Cannot be Stopped

It is human nature to be curious, to strive. Such tendencies are built into our genes. Building godlike artifacts will be inevitable, because we will choose to do it. It would run counter to human nature not to do it.

6.5. Economic Momentum

Once the artificial brain and intelligent robot industries become the world’s largest, it will be very difficult to stop their growth. The economic momentum will be enormous.

6.6. Military Momentum

The military momentum will be even greater. In the time frame we are talking about, China will overtake the US as the century’s dominant power. Since China is still a brutal one party dictatorship, it is despised by the US, so political rivalries will only heat up. The two ministries of defense cannot afford to allow the other to get ahead of it in intelligent soldier robot design etc. Hence Cosmism will be an entrenched philosophy in the respective defense departments.

7. Arguments of the Terrans

7.1. Preserve the Human Species

The major argument of the Terrans is that the artelects, once sufficiently superior to human beings, may begin to see us as grossly inferior pests, and decide to wipe us out. As artelects, that would be easy for them. The Terrans would prefer to kill off a few million Cosmists for the sake of the survival of billions of human beings. Recent wars were about the survival of countries. An artelect war would be about the survival of the human species. Since the size of the stake is much higher, so will the passion level in the artelect war debate.

7.2. Fear of Difference

Terrans will be horrified at the idea of seeing their children becoming artelects, thus becoming utterly alien to them. They will reject the idea viscerally and fear the potential superiority of the artelects. They will organize to prevent the rise of the artelects and will oppose the Cosmists, ideologically, politically, and eventually militarily.

7.3. Rejection of the Cyborgs

The Terrans will also be opposed to the Cyborgs, because to a Terran, there is little difference between an advanced Cyborg and an artelect. Both are artelect like, given the gargantuan bit processing rate of nanotech matter that can be added to the brains of human beings. The Terrans will lump the Cyborgs into the Cosmist camp ideologically speaking.

7.4. Unpredictable Complexity

Given the likelihood that artefacts will be built using evolutionary engineering, the behavior of artefacts will be so complex as to be unpredictable, and therefore potentially threatening to human beings. One of the keywords in the artefact debate is “risk”. Terran global politicians need to hope for the best (e.g. the artefacts will leave the planet in search of bigger things and ignore puny humans) and prepare for the worst, i.e. exterminating the Cosmists, for the sake of the survival of the human species.

7.5. Cosmist Inconsideration

The Terrans will argue that the Cosmists are supremely selfish, since in building artefacts, not only will they put the lives of the Cosmists at risk if the artefacts turn against them, but the lives of the Terrans as well. To prevent such a risk, the Terrans will, when push really comes to shove, decide to wipe out the Cosmists, for the greater good of the survival of the human species.

7.6. “First Strike” Time Window to React against the Cosmists/Cyborgs

The Terrans will be conscious that they cannot wait too long, because if they do, the Cyborgs and the artefacts will have already come into being. The Terrans will then run the risk of being exterminated by the artefacts. So the Terrans will be forced into a “first strike” strategy. They will have to kill off the Cosmists and Cyborgs before it is too late.

If not, the artefacts and Cyborgs will have become too intelligent, too powerful in any human-machine

confrontation and will easily defeat the humans. But the Cosmists will be reading the Terran arguments and preparing for an “artilect war” against the Terrans, using late 21st century weaponry.

8. Arguments of the Cyborgs

8.1. Become Artilect Gods Themselves

The primary aim of the Cyborgs is to become artilects themselves by adding artilectual components to their own human brains, converting themselves bit by bit into artilects. Instead of watching artilects become increasingly intelligent as observers, Cyborgs want that experience for themselves. They want to “become gods”.

8.2. Avoid the Cosmist/Terran Clash

Some Cyborgs argue that by having human beings become artilects themselves, the dichotomy between the Cosmists and the Terrans can be avoided, because all human beings would become artilects. The Terrans of course will reject the Cyborgs and lump them with the Cosmists and artilects. In fact, the growing presence of Cyborgs in daily life will only hasten the alarm of the Terrans and bring their first strike closer.

9. How the Artilect War Heats Up

9.1. Nanotech Revolutionizes Neuroscience

Nanotech, molecular sized robots will revolutionize neuroscience, because they will provide a powerful new tool to understand how the brain works. An entire human brain can be simulated in vast nanotech computers and investigated “in hardware”. Neuroscience will finally be in a position to explain how brains make human beings intelligent. That knowledge will be implemented in the artifacts.

9.2. Neuro-Engineering Weds with Neuro-Science

In time, neuro-science and neuro-engineering will interact so closely that they will become one, in the same way as theoretical and experimental physics are two aspects of the same subject. Neuroscientists will be able to test their theories on artificial brain models, thus rapidly increasing the level of understanding of how intelligence arises and how it is embodied.

9.3. Artificial Brain Technology Creates Massive Industries

With a much higher level of artificial intelligence, based on knowledge of the human brain, artificial brains and artificial brain based robots will become a lot more intelligent and hence useful as domestic appliances. A vast industry of artificial brain based products will be created, becoming the world’s largest.

9.4. “Intelligence Theory” is Developed

Once neuroscientists and brain builders understand how human intelligence is created, new theories of the nature of intelligence will be created by the “theoretical

neuroscientists”. An “intelligence theory” will be created. Human intelligence will be just one “data point” in the space of possible intelligences. Intelligence theory should show how it is possible to increase intelligence levels. It will be able to explain why some people are smarter than others, or why humans are smarter than apes, etc.

9.5. Artilects Get Smarter Every Year

As a result of the marriage of neuroscience and neuroengineering, the artificial brain based industries will deliver products that increase their intelligence every year. This trend of growing intelligence will cause people to ask the questions mentioned in section 4. The species dominance debate will spread from the intellectual technocrats to the general public.

9.6. Debate Begins to Rage, Political Parties Form

As the IQ gap between the robots and human beings gets increasingly smaller, the species dominance debate will begin to rage. Political parties will form, divided essentially into the 3 main schools of thought on the topic, Cosmist, Terran, Cyborg. The rhetorical exchange will become less polite, more heated.

9.7. The Debate Turns Violent, Assassination, Sabotage

When people are surrounded by ever increasingly intelligent robots and other artificial brain based products, the general level of alarm will increase to the point of panic. Assassinations of brain builder company CEOs will start, robot factories will be arsoned and sabotaged etc. The

Cosmists will be forced to strengthen their resolve. The artifact war will be drawing ever closer.

9.8. The Terrans Will “First Strike”, Before Its Too Late For Them

The Terrans will have been organizing for a first strike and will have made preparations. They will then take power in a world wide coup of the global government that is likely to exist by mid century, and begin exterminating the Cosmists and Cyborgs in a global purge, killing millions of them, or at least that is the Terran plan.

9.9. Cosmists Anticipate this First Strike and are Ready

But the Cosmists will be following the arguments of the Terrans and Cyborgs very closely, and will equally be preparing for a confrontation with the Terrans. They will have their own plans and their own weapons and military. If the Terrans strike first, a quick reply will follow from the Cosmists, and the artifact war will have begun.

9.10. Late 21st Century Weapons, Leads to Gigadeath War

If one extrapolates up the graph of the number of people killed in major wars from the early 19th century (the Napoleonic wars) to late 21st century (the artifact war), then one predicts that *billions* of people will be killed, using late 21st century weapons (see the graph in the next section). This “gigadeath” figure is the characteristic number of deaths in any major late 21st century war. About 300 million people were killed for political reasons in the 20th century.

10. Gigadeath

11. Vote

At the end of the talks I give on this topic, I usually invite my audiences to vote on the following question :

“Do you feel personally that humanity should build artefacts, these godlike massively intelligent machines, despite the risk that they might decide, in a highly advanced form, to wipe out humanity? Yes or No.

The result is usually around a 50/50, 60/40, 40/60 Cosmist/Terran split. I noticed that most people, like myself, are highly ambivalent about artefact building. They are awed by the prospect of what artefacts could become, and horrified at the prospect of a gigadeath artefact war. The fact that the Cosmist/Terran split is so even will make the artefact war all the more divisive and bitter. This divisiveness can be expressed in the form of the following slogan :

Do we build gods, or do we build our potential exterminators?

12. Appeal to Philosophers

There is immense scope for philosophical discussion on the artefact issue. At the present time, the philosophical community is largely unaware of the issue, so need to be educated. It is not surprising that the debate is still largely confined to the technocrats, who are better informed of what is coming in technological terms. It is this community after all that is creating the problem (e.g. I am directing a “China-Brain Project”, a 3 million RMB, 4 year project to build a 15,000 evolved neural net module based artificial brain, starting early in 2008). The philosophers will need to create a new branch of applied ethics, that I call “artefact ethics” which will consider such questions as the rights of the artefacts relative to human beings etc. This new field is rich with questions that the moral and political philosophers need to discuss, once they are informed.

13. Quote and Publicity

“I’m glad I’m alive now. At least I will die peacefully in my bed. However, I truly fear for my grandchildren. They will be caught up in the Artefact War, and will probably be destroyed by it”.

Prof. Hugo de Garis, 2000 (Discovery Channel)

Kurzweil vs. de Garis on the BBC

To see a clash of opinions on whether the rise of the artefact will be a good or bad thing for humanity, see the BBC TV program “Human V2.0” in which Prof de Garis and Dr.

Ray Kurzweil discuss the topic. To watch this program you can google with the terms “Human V2.0” and “BBC”. In this program Dr. Ray Kurzweil is optimistic and Prof. Hugo de Garis is pessimistic.

Reference

[1] Hugo de Garis, “*The Artilect War : Cosmists vs. Terrans : A Bitter Controversy Concerning Whether Humanity Should Build Godlike Massively Intelligent Machines*”, ETC Books, 2005, ISBN 0882801546 (available at http://www.amazon.com/Artilect-War-Controversy-Concerning-Intelligent/dp/0882801546/ref=reader_req_dp).

More:

<http://www.agiri.org/docs/China-BrainProject.pdf>

The **China-Brain Project**: An Evolved Neural Net Module

http://www.agi-08.org/slides/de_garis.ppt

http://ai.xmu.edu.cn/artificialbrain/Files/EN_PEOPLE.html