

# **Technological Evolution of Extraterrestrial Civilizations: Dyson Spheres, Warp Drives, Energy Capturing Conquerors**

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## **ABSTRACT**

There are planets in this galaxy over 10 billion years in age. Given the necessity of a stabilizing moon to prevent chaotic obliquity, the number of habitable planets upon which human-like intelligent life could have evolved may range from a minimum of 155 worlds to over 8 billion planets in this galaxy. Intelligent life that evolved on these older worlds may have reached what Nikolai Kardashev has described as Type I, II, III extraterrestrial civilizations billions of years ago. Type I civilizations may be capable of visiting and exploiting other planets in their solar system. Humans of Earth may not reach Type I status for another 200 years. Type II extraterrestrial civilizations would have developed the capacity to exploit the energy resources of their own stars and could have engineered energy capturing megastructures (Dyson spheres). Type III may be capable of harnessing the energy of entire galaxies. It is proposed that Type IV would be capable of conquering the universe and creating a universe and other dimensions. Robotic Artificially Intelligent civilizations may have also evolved in the transition from Type I to Type II. Type II and Type III extraterrestrial civilizations may account for what is now described as “Unidentified Aerial Phenomena.” If Earth is under extraterrestrial surveillance they may be relying on the non-habitation anthropological observational model so they do not affect “natural” human behavior and (A) intend us no harm; or (B) they are monitoring our technological development and if humans become a threat they may destroy our technology and civilization; or (C) as warned by Stephen Hawking, they intend to conquer our planet.

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## **1. Introduction**

For thousands of years philosophers, theologians, priests, and astronomers have believed there is life on other worlds; a concept that may have been first formalized by the Greek “atomists” and which became widely accepted by leading scientists in the late 19th and early 20th century, including Lord Kelvin (1871), and Nobel Laureates Svante August Arrhenius (1908) and Francis Crick. Crick (1981) proposed that a technologically advanced alien civilization may have visited Earth billions of years ago and contaminated our planet with life. Other scientists have proposed that numerous civilizations may have evolved on planets much older than our own (Dick, 2003; Michael, 2014; Todd & Miller, 2018).

As intelligent life and extraterrestrial civilizations evolve their cultural and technological capabilities will evolve (Kardashev 1964; Dick, 2003; Ćirković, 2018) and human-like extraterrestrials who evolved on planets billions of years older than our own, would have likely surpassed our own level of technology billions of years ago (Sagan & Angel 1973). Joseph (2011) has framed this scenario thus so: “The Earth is 4.6 billion years young, and much of our science and technology was invented just a few hundred years ago. If science marches on, consider how technologically sophisticated and scientifically advanced humans might be a thousand years from now. What about 10,000 years from now? Or a million years? What about 100 million years from now? Technologically, they would be like

gods -even if they were merely human.” Joseph (2011) then asks the question: “What might be the creative and intellectual potency of a being whose brain and civilization is 10 billion years older than our own, and which has likely engineered their own DNA, who continued to evolve and who has 10 or more layers of neocortex --compared to those 6 we call our own? What of a civilization that has had 10 billion years to seek technological perfection?”

Sagan (Sagan & Angel 1973) has summed up this scenario thusly: “What does it mean for a civilization to be a million years old? We have had radio telescopes and spaceships for a few decades; our technical civilization is a few hundred years old... an advanced civilization millions of years old is as much beyond us as we are beyond a bush baby or a macaque.”

### **Artificially Intelligent Robotic Civilizations**

It has been proposed that humans in the future or technologically advanced extraterrestrials may have engineered their own DNA creating designer babies that designed their own babies and evolved beyond human understanding (Jones 2009; Joseph 2011). Dick (2003, 2008) and Ćirković (2018) have suggested the evolution of human intelligence may result in the converting of Natural (biological) Intelligence (NI) to Artificial Intelligence (AI) leading to a transformation from a biologically based civilization to a post-biological civilization that would encompass and then extend beyond its own solar system to conquer and exploit the galaxy and eventually achieving technological singularity. Intelligent biological life would then be eradicated or converted by AIs (robotic organisms) and becoming slaves to service and maintain this post-biological civilization (Dick, 2003; Dick, 2008; Ćirković, 2018). In a post biological solar system or galaxy, there might be an exponentially increasing need for mineral resources, including metals, non-metals, metalloids and energy. AIs in a post-biological solar system would be required to colonize and exploit other planets and eventually their own sun, and then other stars, for the appropriation of energy and mineral resources.

### **Type I, II, III Civilizations**

As first proposed by Soviet astronomer Nikolai Kardashev (1964, 1985), as extraterrestrial civilizations evolve they would exponentially and increasingly master the energy resources of their planet, and eventually reach what he called a Type I Civilization, which would be equal to the civilizations of modern Earth, in the exploitation and consumption of energy energy and resources of their own planet. Carl Sagan (Sagan & Angel 1973) and Michio Kaku (2005, 2007), however, argue that the humans of Earth have not yet reached Type I status. Kaku (2007) suggests that if humans increase their energy consumption at an average rate of 3 percent each year, they may attain Type I status in another 200 years.

Type I civilizations would not be capable of visiting other solar systems. However, as a Type I extraterrestrial civilization becomes increasingly technologically advanced, it would eventually become capable of consuming the energy of its own star and exploiting other planets in its solar system for minerals and other resources, and in so doing becoming a Type II civilization. In support of that hypothesis is evidence of what may be energy capturing megastructures orbiting distant stars (Horvath 2015; Wright & Sigurdsson 2016; Joseph & Duvall 2021). As the Type II civilization technologically advances exponentially, it might establish additional megastructures around yet other stars until eventually mastering and exploiting the energy resources of its galaxy and becoming a Type III civilization.

### **The Probability of Earth-Like Intelligent Extraterrestrial Life**

Estimates are that one out of five star systems may be orbited by a habitable planet and up to 80 billion planets could be inhabited (Kunimoto et al. 2020). Over 1350 confirmed “super Earths” have been detected in this galaxy (NASA 2022). Campante et al. (2015) has discovered five sub-Earth sized worlds orbiting Kepler-444 which has an estimated age of 11.2 to 12.2 billion years. Campante et al. (2015) has

proposed that “Earth-size planets have formed throughout most of the universe's 13.8 billion year history, leaving open the possibility for the existence of ancient life in the Galaxy.”

Although there is as yet no conclusive proof, the evidence indicative of extraterrestrial life is substantial. There is evidence that simple forms of life have colonized Mars in the ancient past (Bianciardi et al. 2014, 2015, 2021), and recent findings include what some believe to be fungi growing out of the ground as based on sequential photos (Joseph et al. 2021). Formations similar to algae and lichens have been reported (Bianciardi et al. 2021; Joseph 2016; Dass 2017), and what may be the fossilized remnants of metazoan invertebrates such as tube worms, sponges and corals (Armstrong 2021, 2022; Joseph et al., 2020b; Suamanarathna et al. 2021) and the trace fossils of mollusks and bivalves have been observed (Joseph & Armstrong 2022).

Many scientists have also reported what they believe to be algae, fungi, sponges and corals embedded in meteorites (Birgham 1982; Claus & Nagy, 1961; Nagy et al. 1963a,b; Pflug 1984; Rozanov et al. 2003), some older than this solar system; findings that suggest life may be pervasive throughout this solar system and galaxy (Joseph et al. 2020). If this “genetic seeds of life” scenario is correct, then logically, using Earth and Mars as an example, life would have likely evolved on billions of Earth-like worlds and hundreds of millions of Type I extraterrestrial civilizations would have long ago evolved in this galaxy (Sagan & Angel 1973; Kaku 2007).

The problem with this hypothesis is the necessity that a stabilizing moon must be orbiting each of these habitable planets to prevent chaotic obliquity--as is the situation on Mars-- and enable life to evolve beyond metazoan invertebrates (Joseph et al. 2021, 2022). It is believe another world collided with our own around 4 billion years ago, and the ejecta formed our stabilizing moon which prevents terrestrial axial tilting beyond 25 degrees. By contrast, Mars lacks a large orbiting moon and axial tilt is chaotic and ranges from possibly 0 to 80 degrees which causes catastrophic changes in global temperature, atmospheric pressure, and the stabilization of the oceans which evaporate, freeze, then melt and flood forming lakes and oceans which then freeze again, at the poles and below ground as obliquity declines (Joseph et al. 2022). If life evolved on Mars, then it appears to have progressed only to the level of metazoan invertebrates (Armstrong 2021; Elewa 2021; Joseph et al. 2021, 2022; Suamanarathna et al. 2021). The implications are that habitable planets must have a stabilizing moon; the lack of which would prevent the evolution of highly intelligent, human-like extraterrestrials (Joseph et al. 2022).

What is the probability that the estimated 80 billion habitable planets, the nearly 1400 “super Earths” and the Earth-size worlds over 10 billion years in age, have a stabilizing moon? There are three planets in our solar system that orbit in the “habitable zone” i.e. that would enable complex life to evolve; only one of which has a stabilizing moon and upon which evolved highly intelligent life. Given a liberal estimate of 1 out of 3, then perhaps 26 billion planets (and 466 super Earth) have the potential to sustain and promote the evolution of human-like intelligent life in our solar system. Or, if we reduced the odds to 1 in 9, then 8 billion habitable planets (and 155 Super Earth) may have a stabilizing moon. If we accept the lower estimate, then it is probable that highly intelligent human-like life may have or will evolve on at least 155 planets in this galaxy.

Kaku (2007) suggests that our world-wide civilization may enter Type II status in a few thousand years, and Type III status in 100,000 years. If these intelligent life evolved on at least 155 planets older than our own, then exponentially, and considering the rapid technological advances that have occurred on Earth in the last 300 years, then it can be predicted that a number of Type I and Type II extraterrestrial civilization developed billions of years ago. Evidence of what may be energy capturing megastructures is supportive of that latter hypothesis (Horvath 2015; Wright & Sigurdsson 2016; Joseph & Duvall 2021).

### **Energy Capturing Megastructure Dyson Spheres?**

Some scientists believe that intelligent life is rare in this galaxy (Gallup & Faliveno 2022). Others

have proposed that extraterrestrial life is pervasive and that living organisms similar to but far more intellectually and technologically advanced than humans may have developed energy-capturing megastructures that now orbit distant stars (Horvath 2015; Wright & Sigurdsson 2016; Joseph & Duvall 2021). NASA has even awarded itself \$300 million dollars to search for alien megastructures (Oberhaus & Donlin, 2021); also referred to as “Dyson Spheres.” As based on Kardashev’s classification system, the inhabitants of any planet that created a Dyson Sphere would have achieved or surpassed Type II civilization status.

The first clues to the possible existence of megalithic “Dyson spheres” was reported in 2015, following the discovery of an unusual light curve of F dwarf star KIC 8462852 and that was characterized by brief, deep 20% drops in flux, with non-periodic repetitions and asymmetric dips (Boyajian et al. 2016). These reports were confirmed by Schaefer (2016) and Montet & Simon (2016). This evidence indicates that numerous titanic light-blocking objects must be orbiting that sun. Saito et al. (2018) reported that star VVV-WIT-07 also displays a sequence of recurrent dips; and in 2019, an additional 21 stars were detected with similar light dipping and dimming patterns most of which are similar to KIC 8462852 (Schmidt, 2019). These periodic episodes of dimming suggests that a group of mega-objects over a million kilometers wide are repeatedly passing close to and orbiting these stars. These discoveries have led to speculation that technologically advanced extraterrestrial civilizations have constructed titanic energy collecting megastructures (Horvath 2015; Wright & Sigurdsson 2016; Joseph & Duvall 2021). In this galaxy, there are super-Earths that orbit stars over 10 billion years in age (Campante et al. (2015). If humans evolved on these planets they may have “evolved” beyond humans of Earth billions of years ago, and may be responsible for what could be titanic energy-capturing megastructures orbiting stars in this galaxy (Horvath 2015; Wright & Sigurdsson 2016; Joseph & Duvall 2021).

### **Unidentified Aerial Phenomena: Evidence of Type II Civilizations**

For thousands of years there have been reports of saucer shaped and other unusual structures that fly at great speeds or hover above towns and cities. In WWII, pilots from numerous countries reported confrontations with aerial phenomenon, some cloud or saucer shaped others elongated and that could fly at great speeds (Joseph 2017); and these reports have continued into the present. According to “the USA Office of the Director of National Intelligence” at last some of these “Unidentified Aerial Phenomena (UAP)” may be of extraterrestrial origin, and the Earth and its inhabitants are under the surveillance of extraterrestrials who fly craft capable of hypersonic speeds and engage in turns and maneuvers that require a technology far in advance of our own. If these craft are extraterrestrial, it can be assumed they were created by a civilization that has achieved Type II status. If they are under robotic AI or biological control and were created by biological or robotic AI non-biological civilizations is unknown.

Billions of Type I and Type II Extraterrestrial Civilizations in this Universe?

Intelligent extraterrestrial life or Type I and Type II extraterrestrial civilizations may be quite rare in this galaxy (Gallup & Faliveno 2022). However, if even if there is only one habitable planet per star that gives us an estimated 400 billion planets (assuming 400 billion stars), but if there are three planets orbiting in the habitable zone of each star, the number jumps to 1,200 billion. Given Joseph et al’s (2022) caveat about the necessity of a stabilizing moon, then perhaps, intelligent extraterrestrial life is relatively rare in this galaxy, with a highly conservative estimate of a minimum of 155 worlds that may have evolved a Type I or Type II civilization.

Given the unknown number of galaxies in the known universe--and which may easily exceeds billions of trillions of galaxies--then it can be predicted that within the entire universe intelligent extraterrestrial life and Type I and Type II extraterrestrial civilizations may also number in the billions.

### **Extraterrestrial Anthropologists?**

As warned by astrophysicist Stephen Hawking: “To my mathematical brain, the numbers alone

make thinking about aliens perfectly rational. The real challenge is to work out what aliens might actually be like..." According to Hawking aliens "would be only limited by how much power they could harness and control, and that could be far more than we might first imagine...Such advanced aliens would perhaps become nomads, looking to conquer and colonize whatever planets they can reach...I imagine they might exist in massive ships, having used up all the resources from their home planet...If aliens ever visit us, I think the outcome would be much as when Christopher Columbus first landed in America, which didn't turn out very well for the Native Americans"

Although acknowledging unconfirmed reports of "encounters" with or observations of what may or may not be extraterrestrial space craft, Gallup and Faliveno (2022) have pointed out that there is no confirming evidence; and notes that Venus and Mars orbit in the habitable zone of our solar system, but there is no evidence of that extraterrestrial intelligent human-like life evolved on these or other worlds. It could be asked: If there are Type I, II, or III civilizations "out there" then why don't they announce themselves? Gallup and Faliveno (2022) suggest they may be afraid of us and hiding from us.

If extraterrestrial civilizations exist, and they are observing us, then another possibility is that good anthropologists they may be employing the "non-habituation" method while conducting anthropological research to understand human and animal behavior. As is well known, anthropologists who study Apes in the field, in their natural environment, use two methods: (A) Habituation: they let the Apes know they are being watched and the Apes habituate and grow accustomed to be watched, or (B) Non-Habituation: the apes do not know they are being watched and thus human observations has no effect on ape behavior. Perhaps extraterrestrials do not want the peoples of Earth to know they are being watched, because that will affect and change human behavior.

If Earth is under extraterrestrial surveillance, we should ask about their long range intentions. Perhaps (A) They mean us no harm. They just want to study us. (B) They are monitoring human behavior and technological development. If we become a threat, they may try to eradicate us. (C) They intend to conquer our planet when they get enough information.

### **Type III & IV Civilizations: Conquerers or Creators of the Universe?**

As Type II civilizations evolve and conquer additional galaxies, eventually they may become Type III civilizations and master the energy resources of the entire universe. Is there any evidence in support of that intriguing possibility? Perhaps only as speculation in the realm of theological belief or the quantum physics of multiple dimensions (Barrow 1998). Kaku (2007) believes that if such civilizations exist they may have harnessed "extragalactic" energy including dark energy and in so doing would become a Type IV civilization. A Type IV could have created our own universe or the dimensions in which we dwell.

Life that has achieved Type IV, or which might be described as Type IV, would essentially be godlike, and thus "god" that created the universe and life in this universe. However, this is a subject best left to discussion and debate among the theologians.

### **Type O Extraterrestrial Civilizations**

Dean Falk (2021) argues that the development of complex tool technology, beginning with simple stone tools, requires a hand with four fingers and an opposable thumb and a brain capable of controlling that hand and employing foresight. Falk (2021) notes that water worlds may be common; and therefore, any mammals that evolved would be creatures of the sea such as or similar to Cetaceans. Although highly intelligent and social, life adapted to living beneath and within the sea, would not have evolved tool technology because they lacks fingers and hands. Falk (2022) proposes that only extraterrestrial primates would be capable of evolving to the level of human intelligence and beyond.

On some living planets, humans may have never evolved and that in the absence of primates, other social mammals, such canines may have learned to walk on two legs and developed hands, fingers, and tool technology. Some worlds may be dominated by complex and highly evolved insect societies that

may have evolved human-like capabilities (Joseph 2011) As pointed out by Joseph (2011), even on those Earth-like worlds where life similar to humans has evolved, there is no guarantee they would or will achieve a Type I civilization. Consider the ancient but highly advanced Sumerian, Egyptian, Chinese, Babylonian, Greek, Roman, Mayan, Aztec and other civilizations; that despite their great cultural, scientific, philosophical, and artistic achievements, never harnessed electricity or developed the gasoline motor or a combustable engine. On Earth, despite the evolution of “modern” humans 30,000 years ago, the technological revolution did not begin until around 300 years ago.

Even if intelligent extraterrestrial life evolved on thousands or even billions of planets in this galaxy, there is no guarantee that they would have achieved, or will ever achieve, what Kardashev classified as a Type I civilization.

**Mineral Resources & the Evolution of Extraterrestrial Civilizations**

When a hypothetical extraterrestrial civilization goes through different levels of the Kardashev scale, in addition to increasing its requirement for energy resources, it also requires more mineral resources to build its machines and megastructures (such as Dyson spheres, Dyson-Harrop satellites, Badescu-Cathcart engines, Shkadov thrusters, Interstellar spacecraft, Caplan thruster, Warp drives, and Bussard-Ramjet engines). As a rule, the mineral resources of the parent planet of any extraterrestrial civilization may not be enough to build, maintain and fuel these machines and megastructures. So, they must be obliged to the colonization and mining of other terrestrial bodies to obtain their essential resources. Table 1 shows the importance and application of some elements in manufacturing technological equipment in human civilization (Arkles & Wilson, 2013).

**Table 1.** Usage of various elements in constructing advanced technologies in a hominid biological civilizations

Element type	Usage in the construction of techno-signatures
H	Rocket fuel
Ti	High strength and low weight in airborne machines, spacecraft, and rocket fitment
V	High thermal resistance
Cr	Plating, catalysts, and alloys
Fe	Extensive usage in the manufacturing of tools, weapons, and machines
PGE	Fuel for jet engines, fuel cells, catalysts, and electrical connectors
Cu	Conductor of heat and electricity, manufacturing of weapons
Se	Electronics technologies and alloys
Rb	Electrical conductor, catalyst
Sr	
Cd	In nuclear reactors
Zr	
Nb	High thermal resistance components in rockets and airborne machines
Ag	Heat and electricity conductors, electronic technologies
Li	Light airborne machine parts
Be	In airborne machines and rockets, and the production of resistant materials at high temperatures
Al	Airborne machine fitment
REE	Aeronautical instruments, lasers, superconductors, microwave filters, electric motors, nuclear reactors, computer memory, optical spectrometers, and optical fibres
Water ice	Energy production via vapour, heat transfer, mechanical activities

**Energy Capturing Megastructures Employed by Extraterrestrial Civilizations:**

The megastructures created by extraterrestrial Type II and Type III civilizations can serve various purposes, including energy appropriation and expeditious interstellar travels via “stellar engines.” or employed for “astro-engineering projects.” Theoretically, these star orbiting megastructures (also known as Dyson Spheres) can be classified as belonging to at least three categories depending on their purpose (Badescu & Cathcart, 2006; Caplan, 2019).

For example, what have been hypothesized as “Class A stellar engines” (also known as “Shkadov

thrusters”) are megastructures consisting of a gigantic concave solar mirror or sail that orbits near the system's sun that deflects and magnifies light (or radiation pressure). This doubled radiation pressure is used to generate the thrust force of spacecraft (Forgan, 2013).

Theoretically, Type B stellar engines include "Dyson spheres" installed around the system's sun, absorbing the whole of its energy for consumption of an advanced civilization on an extrasolar planet. Unlike A-type stellar engines, these megastructures may or may not generate thrust force. These megastructures around the stars are defined by intense infrared radiation. As of this writing, there have been no confirming observations of megastructures (Wright, 2020).

If a Dyson sphere were to be built around our sun, it must have a radius of at least 1.66 AU, a shell thickness of 8 cm, and an average density similar to steel. Although these megastructures can generate much energy, their construction would require advanced technological discoveries and applications. In addition to cataclysmic events such as melting, explosion, and outward spherical shell drift, vast volumes of mineral resources would be required to manufacture these megastructure.

However, instead of megastructures, Type II civilizations can use the Dyson-Harrop satellites instead of these spherical shells. These structures, whose manufacturing is more feasible than the Dyson spheres--at least from our level of technological understanding-- include a set of satellites that absorb electrons, protons, and positive ions from the solar wind and generate electrical energy (Harrop & Schulze-Makuch, 2010; Inoue & Yokoo, 2011).

The hypothetical Type C stellar engines, also known as “Badescu-Cathcart” engines, are megastructures that consist of a combination of A and B type stellar engines. Similar to Shkadov thrusters, they would be capable of generating thrust force for different types of spacecraft and could served as generators of stellar energy.

Theoretically, stellar engines could be combined Dyson spheres whose inner surface is covered with a Shkadov mirror (Badescu & Cathcart, 2006; Lingam & Loeb, 2020). Tremendous amounts of energy could therefore be narrowly focused to a single target.

In addition, advanced extraterrestrial civilizations may be capable of building stellar accessory engines, such as “Caplan thruster (or Bussard engines)”. Theoretically, these engines use concentrated stellar energy to agitate a part of the star's outer surface. As a result of this process, flares of the solar wind are produced on the star's surface generating powerful solar wind that are then harnessed and employed to fuel "Bussard-Ramjet jet engines”. This process results in the direct generation of plasma, which can be used as propellant fuel in a variety of jet engines (Caplan, 2019).

Another possible advanced technology may employ a magnetic sail interstellar spacecraft that can also serve as robotic probes (Cohen and Brody, 1991; Mewaldt & Liewer, 2000; Signal & Signal, 2013). Type III civilizations (including cyborg organisms) may use Warp drives or Lorentzian wormholes for their interstellar travels at much longer distances instead of the interstellar spacecraft. To manufacture these ultra-advanced technologies, in addition to colossal energy resources, vast volumes of highly diversified mineral resources would be required (Puthoff, 1996; Ćirković, 2008).

The entire mentioned hypothetical techno-signatures of superhuman civilizations have two important communion points. Firstly, the level of technology in these machines and megastructures is beyond our capability as are the different types of metals, non-metals, and metalloids are required to manufacture them. Secondly, based on our level of technology, these stellar engines or machines may be gigantic and require vast mineral resources for manufacturing. Or, conversely, they may be so small as to achieve nano-structure.

These factors reveal the requirement of extraterrestrial civilizations to appropriate further and more diverse mineral and energy resources. Hence, again, based on our level of understanding, these civilizations would have colonize and mine other planets, moons, and asteroids in their stellar system and

even their galaxy (Veysi, 2021). Figure 1 shows a simple graphical illustration of the stages of the cultural evolution of extraterrestrial civilizations, and its relationship with the increasing requirement of these civilizations for mineral and energy resources.



**Figure 1.** The stages of development of extraterrestrial civilizations (cultural evolution), and increment their requirement for mineral and energy resources.

### Advanced Technology, Celestial Energy and Mineral Resources

Presumably, technological advanced extraterrestrial civilization can extract its essential elements (mineral resources) from neighboring moons, planets, and their own stars. However, stars do not generate elements heavier than iron, such as alkalis, lanthanides, and actinides (a hypothetical essential for manufacturing advanced and ultra-advanced technologies). Nevertheless, these elements can easily form in silicate terrestrial bodies. As a result, extraterrestrial civilizations will eventually obtain mineral and energy resources from other the planets, moons, or asteroids. Table 2 shows the relationship between the type of planets and the type of mineral resources (Veysi, 2021).

**Table 2.** Relationship between the planets type and terrestrial bodies, with the type of mineral resources on them, for usage by the technologically advanced civilizations.

Planet type	Element type
Gaseous giants	H
Silicate planets with plate tectonics and stagnant lid tectonics style, both	Ti
	V
	Cr
	Fe
	PGE
Silicate planets with plate tectonics style, merely	Cu
	Se
	Rb
	Sr
	Cd
	Zr
	Nb
	Ag
	Li
	Be
	Al
REE	
Icy moons, ice, and ocean planets	Water ice



Just as the combustable engines, supersonic jets, televisions, radios, and the internet would have been inconceivable to humans thousands of years ago; the technological capabilities of Type II and III civilizations may also exceed our understanding. They may be capable of generating minerals, metals, energy and even alternate realities and dimensions from sources and via technologies that seem improbable. Indeed, the science of the future, of Type II and III civilizations, might appear to us as “magic” today.

### **Conclusions**

There are stars and planets billions of years older than our own. If human-like intelligent life evolved on just a few of these worlds, they may have achieved Type I, II, and III civilizations, and developed technologies beyond our comprehension, billions of years ago. If Earth is under extraterrestrial surveillance they may be relying on the non-habitation anthropological observational model so they do not affect "natural" human behavior and (A) intend us no harm; or (B) they are monitoring our technological development and if humans become a threat they may destroy our technology and civilization; or (C) as warned by Stephen Hawking, they intend to conquer our planet.

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