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RESEARCH ARTICLE

A non-anthropocentric solution to the Fermi paradox

Vojin Rakić

Center for the Study of Bioethics, University of Belgrade, Belgrade, Serbia
Email: vojinrakic@hotmail.com

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Abstract

A few dozens of solutions to the Fermi paradox have been proposed in the past. The most relevant ones will be concisely discussed in this paper. They will be classified as follows: exceptionality solutions, annihilation solutions and communication barrier solutions. The argument will be advanced that all existing resolutions to the Fermi paradox are in their essence anthropocentric. The epistemological groundwork of anthropocentrism will be discussed. Conversely, in this paper, a non-anthropocentric solution to the Fermi paradox will be proposed: the 'lasting human epistemological limitations solution'. This resolution to the Fermi paradox acknowledges that human epistemological capacities are limited to the degree that not only extraterrestrial forms of life may be unobservable to the human perceptive apparatus, but that universes may exist around humans with forms of life, inorganic matter or entities of any other type that humans are incapable of perceiving. In light of the revolutionary developments in theoretical physics, it is likely that in the future these developments will be reflected in increasingly non-anthropocentric solutions to the Fermi paradox.

Contents

Introduction

The Fermi paradox is the conflict between the argument that the enormity of the universe seems to favour intelligent life being common in the universe, and the argument that humans have no evidence of extraterrestrial intelligent life.

Attempts to solve the Fermi paradox abound and this paper will briefly go over the most relevant ones in the second section. In the third section, an original alternative solution to the Fermi paradox will be proposed.

It will be argued that until now all proposed solutions to the Fermi paradox have in their essence been anthropocentric. Anthropocentrism is the belief that humans possess an intrinsic value that positions them on a level of existence that is more important than that of animals, plants, minerals, God or

any other being/entity. It assumes that humans have a superior moral status. Hence, anthropocentrism frequently determines the value of all other beings on the basis of the instrumental value for humans, that is, on the basis of the issue to what extent they are useful to humans. Hence, humans occupy a central place in the universe. This also follows from the etymology of the word anthropocentrism: in Ancient Greek ἄνθρωπος *(ánthrōpos)* means 'human', while *κέντρον (kéntron)* means 'centre'.

Although anthropocentrism is often defined in contradistinction to the importance of the environment or animals (i.e. other natural but non-human phenomena), of God (as understood in Judeo-Christian and Islamic traditions) and is also at the basis of socio-political constructions of the meaning of 'human rights', in this paper the meaning of anthropocentrism centres on the epistemological tendency of humans to understand non-human biological phenomena by analogy to humans. This tendency has been addressed extensively by Kant in his highly influential elaborations on the limitations of human cognition and his notion of space and time as 'a priori forms of apperception' (which will be addressed later in this paper), as well as in a different form in Ludwig Wittgenstein's concept of linguistic meaning (e.g. Wittgenstein, 1953). Occasionally, the meaning of anthropocentrism will be grounded not only in epistemology, but to some degree also in ethics. This is obvious throughout the article from the context in which the term is being used.

Reasoning by analogy to humans is a thinking strategy that is not demanding, as it applies one's personal experiences to other biological phenomena, or even to non-biological phenomena (e.g. God). Hence, anthropocentrism is also in an epistemological sense a form of human supremacism, in that it assumes that human comprehension of phenomena is superior or even the only possible form of comprehension.

In this paper, a certain type of anthropocentrism in cosmology will be discussed, although scientists in this field have generally been careful not to fall victim to anthropocentrism. It will be demonstrated however that also in this field, specifically in the case of the proposed solutions to the Fermi paradox, scientists have not remained immune to anthropocentrism. In cosmology, anthropocentrism discusses alien intelligence from a human epistemological perspective. Even those solutions which assert that alien super-intelligent life has taken the form of a technologically advanced mechanism designed to be unobservable to humans, also focus on humans who have been bypassed by more intelligent AI systems that have developed with the passing of time and eventually have become undetectable to humans.

The solution that will be advanced in this paper addresses the Fermi paradox from the perspective of vast human epistemological limitations, that is, from a non-anthropocentric epistemological perspective. It will be argued, namely, that human epistemological capacities have probably *always* been able to detect only a limited number of organisms, non-living matter and other entities – both extraterrestrially and on Earth. The reason for this is that humans have access to a limited number of dimensions and entire 'worlds' may surround them with phenomena they do not perceive. For the sake of simplicity, we can call them parallel universes.[1]

It is estimated that there are up to 400 billion stars in the Milky Way alone (4×10^{11}), and 7×10^{22} in the universe humans are capable of observing (Craig, 2003; Cain 2013).

These numbers are so staggering that it is not only possible, but also highly likely that intelligence that is more developed than human intelligence resides at various places in the universe. In fact, it is almost certain that a multitude of super-intelligent entities exist in an almost infinite universe, but that humans do not perceive them.[2]

Enter the *mediocrity principle*. The mediocrity principle is a philosophical concept asserting that if an item is to be drawn randomly from one of several categories, it is more likely to be drawn from the most numerous category than from any other category (Kukla, 2009). This principle implies that there

[1]The term 'parallel universe' is used here more broadly than in theoretical physics. Such universes do not need to come into existence via the middle of a black hole (where the curvature of space-time is infinite) and via the creation of a wormhole, as is being argued by various theoretical physicists. The term 'parallel universe' denotes here any universe that is undetectable to humans because of their limited epistemological capacities.

[2]The term 'super-intelligent' has in this paper the meaning of more intelligent than the *homo sapiens*.

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is nothing particularly unusual about the Earth, the Solar System or the evolution of the *homo sapiens* on Earth. It assumes mediocrity, rather than the notion that a certain phenomenon is exceptional.[3]

An implication of the mediocrity principle is that, even if intelligent life occurs on only an extremely small percentage of planets around stars that are observable to humans, there might still be a considerable number of extremely distant civilizations with intelligent life that are currently unobservable to humans. If this percentage were sufficiently high, it would imply the existence of a significant number of distant civilizations even in the Milky Way – not to speak in other galaxies or in the universe still unobservable for humans. Hence, according to the mediocrity principle, the Earth is not unique. It is one planet with typical traits for that sort of planets. The existence of humans on such a planet is therefore not something that should be surprising.

Furthermore, in light of the ability of intelligent life to overcome shortages of resources, and its possible need to colonize new habitats in search of new resources, it should certainly not be excluded that at least some civilizations attempt to find and indeed do find new resources in space. If they are technologically sufficiently advanced, they may colonize their star system and, subsequently, surrounding star systems as well.

However, as there is no conclusive evidence of the existence of extraterrestrial intelligent life in the universe observable for humans, we face a paradox that requires a resolution. That is the Fermi paradox.

Resolutions to the Fermi paradox range from a relativization of the mediocrity principle (employing the argument that intelligent life is rarer than the mediocrity principle suggests) to the assumption that current scientific comprehension of the universe itself is incomplete. Webb (2002) enumerated 50 solutions to the Fermi paradox. In this paper, a number of such solutions will be stipulated. Some of them follow Webb (2002), some of them unite more solutions discussed by Webb, while some are not included in Webb's study.

Before that, it is in order to mention that in Fermi's time, the existence of an abundance of suitable planets for intelligent life was assumed only. Nowadays, however, this assumption is bolstered by the discovery of exoplanets. This discovery resulted in the development of the prediction that billions of habitable worlds exist in the Milky Way alone. In the following section, the most relevant solutions to the Fermi paradox will be briefly highlighted.[4]

Possible solutions to the Fermi paradox

In this paper, the possible resolutions to the Fermi paradox will be categorized as follows: exceptionality solutions, annihilation solutions and communication barrier solutions.

Exceptionality solutions

The Earth is an exception

The 'Rare Earth Hypothesis' argues that the development of life and of a rare type of biological complexity (multi-cellular organisms and sexual reproduction) led to the emergence of the *homo sapiens* and to human intelligence. This required a highly unlikely or even unique combination of astrophysical and geological circumstances. The Earth, having had such circumstances, is an exception. Hence, extraterrestrial life is unlikely to exist. If it does exist, it can only be rare (Ward and Brownlee, 2000).

Intelligent life is an exception: 'The Rare Intelligence Hypothesis'

In line with the terminology used in the formulation of the 'Rare Earth Hypothesis' I use the term 'Rare Intelligence Hypothesis' in order to denote the phenomenon that extraterrestrial intelligence is rare or

[3]See https://www.britannica.com/science/principle-of-mediocrity; last accessed on 25 January 2024.

[4]For an elaborate analysis of solutions to the Fermi Paradox, useful is also Ćirković (2020).

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non-existent. Hence, the development of life is not rare, but the development of an advanced form of intelligence is improbable. On our planet some of the forms of life with evident or likely intelligence are apes, dolphins and whales. Unlike the human, none of them has built a Boeing 747 or Airbus A380, or even come close to building it. Hence, human intelligence has come into existence as an adaptational mechanism that required exceptional circumstances. It can therefore be expected that advanced forms of intelligence, similar to the form that characterizes humans, are rare or non-existent (see Lineweaver, 2019).

Ćirković *et al.* (2005) argue however that the development of human intelligence was not a necessary adaptational mechanism for humans in order to survive throughout their evolution. In line with this argument, they strongly favour other explanations for the emergence of human intelligence. Hence, mechanisms other than adaptation can be expected to explain the emergence of extraterrestrial intelligence as well. Consequently, extraterrestrial intelligence is likely to exist in various forms, including forms of intelligence that are superior to human intelligence.

Annihilation solutions

Periodic annihilations of intelligent life that are caused by natural events

Possibly the best-known example of the extinction of entire species on Earth is associated with dinosauruses. It is likely caused by volcanic eruptions, a massive meteorite impact or another destructive astrophysical event. Avian dinosauruses were not obliterated, which bolsters this hypothesis.

Moreover, global heating or global cooling may have annihilated various species on Earth. It is feasible that similar events have resulted in the annihilation of intelligent life on other planets in the universe, before these forms of life could have acquired the capability to communicate with humans (see Ćirković, 2008).

Advanced forms of intelligence have the tendency to destroy themselves

Some other solutions to the Fermi paradox posit that it is not natural events that obliterate intelligent life, but that intelligent life has a natural tendency to destroy itself. Advanced intelligence in a civilization has the proclivity either to dominate other civilizations or to strive for an 'easy life'. The former leads to conflicts with other civilizations in the universe and eventually to annihilation, while the latter has decadence and finally mental and biological decay as its result (Von Hoerner, 1961).

The stage at which intelligent life becomes capable of space travel is a stage at which it becomes particularly vulnerable. Interstellar connectedness makes intelligent life more vulnerable rather than resilient. Reasons include accidental contamination in space, resource depletion, destructive mistakes made in the creation of artificial intelligence and climate change (see Hite and Seitz, 2020).

Another solution is proposed by Stephen Hawking who argued that at a certain point in the evolution of interstellar communication, knowledge production becomes more important than knowledge transmission of information. That is allegedly the point at which the system becomes unstable and consequently destroys itself (see Yudkowsky, 2008).

Advanced forms of intelligence have the tendency to destroy others

Another solution to the Fermi paradox that has been proposed is that intelligent life beyond a certain point of technological development will destroy other intelligent forms of life once they appear.

The reason for such a proclivity to annihilate other intelligent forms of life may be the desire for power, aggression, paranoia, envy or a motive that is incomprehensible to humans. Edward Harrison argued that the obliteration of other forms of intelligent life is a rational choice: once an intelligent form of life overcomes its self-destructive menaces, it is likely to perceive other intelligent forms of

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life as a threat (see https://web.archive.org/web/20070929092545/http://www.astrobio.net/news/modules.php?op=modload&name=News&file=article&sid=1745l; last accessed on 24 January 2024).[5]

Communication barrier solutions

Civilizations broadcast signals that are only detectable for a short period of time

If intelligent alien civilizations broadcast detectable signals only for short periods of time, the likelihood of humans noticing them becomes lower. Moreover, advanced intelligent alien civilizations may communicate via technologies that have not been developed by humans (e.g. see https://nautil.us/we-might-already-speak-the-same-language-as-et-238528/; last accessed on 25 January 2024).

Extraterrestrial intelligent life may be incomprehensible to humans

Extraterrestrial forms of life may dramatically differ from life on Earth, and be disinterested to communicate with humans. There might also be another communication barrier involved, as extraterrestrial life forms may communicate in ways humans cannot detect.

Arthur Clarke argued that human technology may be 'laughably primitive' in comparison with some extraterrestrial technology. Hence, humans do not have the capacity to comprehend such a technology (Fadiman, 1990).

Alien life may reside too far away from humans

The idea that alien life exists, but not in our observable vicinity, implies that alien extraterrestrial intelligence has settled only parts of the universe. These parts are likely to be close to the planets on which alien extraterrestrial intelligence resides (Haqq-Misra and Fauchez, 2022).

Related to this hypothesis is the idea that extraterrestrial life has stripped itself from a physical from. It has created massive artificial virtual environments, and transferred itself into these environments via mind uploading. It currently exists in a virtual world and disregards the physical universe. For this solution to the Fermi paradox, instructive are various writings of Nick Bostrom (e.g. https://www.technologyreview.com/2008/04/22/220999/where-are-they/; last accessed on 25 January 2024).

Lack of resources alien life needs in order to extend physically in the universe, and the inability of humans to detect information sent by extraterrestrial forms of life

Scientific knowledge of alien intelligent life may not be able to assess the resources it needs for interstellar colonization. Even if interstellar colonization were possible, it may require extensive resources and therefore be too difficult.

Moreover, although interstellar communication based on the sending of signals is likely to require much fewer resources than interstellar travel, humans may be unable to observe them (Scheffer, 1994).

Humans have not listened properly or long enough to detect alien life

Humans may fail to notice signals from extraterrestrial life. Such signals exist, but go undetected by humans. Extraterrestrial life forms may transmit signals that have frequencies or data rates that are undetectable to humans. Moreover, such frequencies might turn out to be undistinguishable from background noise (Turnbull and Tarter, 2003).

[5]I am indebted to an anonymous reviewer who pointed out that advanced forms of intelligence do not necessarily have the tendency to destroy others, because warfare would increase the detection of belligerent civilizations. We have however not identified such civilizations.

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Alternatively, one can posit that humans have not listened for a sufficiently long time. Humans have only since recently sophisticated telescopes at their disposal. Moreover, for cosmological standards, humans exist a very short time. Hence, alien intelligence may not have detected humans, because they came into existence only recently, and additionally, they did not have sufficient time to make *themselves* detectable to other extraplanetary intelligences (Baum *et al.*, 2011).

Intelligent extraterrestrial life may be too distant

According to this proposal for solving the Fermi paradox, civilizations face extinction before they detect a transmitted signal from another alien civilization. Sebastian von Hoerner estimated the average existence of a civilization at less than 7000 years, while the average distance between civilizations in the Milky Way is around 10 000 light years (Webb, 2002). Hence, it is possible that civilizations become extinct before they can establish a dialogue with an alien extraplanetary intelligence. In fact, human searches might be able to detect the existence of alien intelligence, but not to communicate with it – because of the vast distance.

Every intelligence is listening but not one is transmitting

Alien civilizations, as well as humans, may be eager to receive information, but for some reason do not transmit it ('the SETI paradox'; see also Webb, 2002). One of the reasons can be that alien civilizations do not wish to come into contact (again?) with humans because it is too dangerous. The dangers can reside, for example, in computer codes or even in toxic ideas (Marsden, 1998).

Earth is deliberately being avoided or isolated

The 'zoo hypothesis' posits that intelligent extraterrestrial intelligence does not contact life on Earth in order to allow for its natural development. This extraterrestrial intelligence only observes humans (Ball, 1973).

An idea that is related to the zoo hypothesis is the 'planetarium hypothesis': beyond a certain distance the universe that is perceived by humans is a simulated reality. Extraterrestrial intelligence has allegedly created this simulation in order to leave an impression on humans that nothing more developed than human intelligence exists (Baxter, 2001).

Alien life is already here, but it remains unacknowledged

Some people believe that at least some Unidentified Flying Objects (UFOs) are spacecraft that are being steered by aliens. A scientific consensus has however been developed in favour of the thesis that there is no conclusive scientific evidence for the mentioned assumption (Shermer, 2011). Hence, this 'solution' will not be regarded here as a possible resolution to the Fermi paradox.

An alternative solution to the Fermi paradox: the lasting human epistemological limitations solution

In this section, an alternative resolution to the Fermi paradox will be proposed. It has certain similarities to the solution that super-intelligent alien civilizations have taken the form of entities humans cannot perceive. My proposal does not exclude this possibility, but goes further.

Human epistemological capacities, namely, have always been limited, so that humans may be surrounded by beings that even live around them, although they do not perceive them. It is indeed possible that super-intelligent extraterrestrial civilizations have taken the form of entities humans cannot perceive, but that is just a fragment of the solution that is being proposed in this paper.

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Beings that are unobservable to humans do not have to be super-intelligent beings that have taken the form humans cannot perceive. They may have always had such a form. There is no reason to accept the anthropocentric scenario that they have taken this form in order to deceive humans or at least to become undetectable to humans.

Moreover, these beings do not have to be super-intelligent. They may be far less intelligent than humans. They even do not have to be sentient. Moreover, they might reside *around* humans, but be undetectable to them. Humans may have never had the capacity to notice such entities. Hence, my proposed solution belongs to a fourth category. I will call it the *lasting human epistemological limitations solution*.

The entities that have never been perceived by humans because of lasting human epistemological limitations may exist in dimensions humans are incapable of accessing. A significant number of humans believe that they are the most intelligent beings that have been encountered until now (i.e. encountered by humans). That is a highly biased anthropocentric assumption.

For example, what can we conclude about organisms that immediately surround humans? Bugs or worms do not perceive humans as humans perceive themselves. They may experience the consequences of human behaviour. Humans can kill them, but bugs or worms will not understand how the lives of their killed kin have been ended. Bugs or worms will experience the consequences of human behaviour, but they are highly unlikely to ever acquire the capacity to perceive humans as they are (or as humans perceive themselves).

Other more advanced organisms than worms or bugs, or artificial entities (possibly certain types of AI), are likely to be capable of observing humans, but in a way that is unknown to humans. How do dolphins or whales perceive humans? How can humans obtain an insight into their perceptive apparatus? They still don't know it.

It is therefore not only feasible that for humans unobservable extraterrestrial life exists, but that also in their immediate vicinity organisms live (or even inorganic entities exist) that humans cannot perceive. Similar to a worm or bug that does not perceive humans, but only experiences the consequences of human actions, humans may not have the perceptive apparatus necessary to notice the existence of certain entities around them. Humans may only experience the consequences of the behaviour of such entities, but not their existence. Furthermore, humans might not even experience the consequences of the behaviour of these organisms. As a matter of fact, in certain cases they might experience them and in other cases not.

Some forms of life surrounding humans can be cognitively more advanced than humans, while some other organisms humans cannot observe may even be less cognitively advanced than humans. Both types of organisms can exist on our planet, but they can also be for humans unobservable extraterrestrial forms of life.

Furthermore, humans may not perceive a variety of phenomena around them that are not living beings. Back to the bug, this time an imaginary bug: this form of life may, for example, be able to perceive space in one dimension only; another, cognitively more advanced bug, may perceive space in two dimensions. Humans perceive space in three dimensions, but it is possible that additional dimensions of space exist.

This explanation does however not end there. Humans perceive time in one dimension only. That is a straight line that humans perceive only in one direction: the past. Humans have a conception of the future, but they do not know what will happen in the future. It is entirely feasible however, that the other direction of time already exists – that the future is in a universe that surrounds humans, but that humans cannot observe it.

It is also possible that, similar to the space that humans perceive, time also has three (or more) dimensions. Humans cannot even imagine how the two (or more) additional dimensions of time would 'look like'. In that respect, humans resemble the bug that perceives space in one dimension only. It has almost certainly no conception whatsoever of how three-dimensional space may look like.

Not being able to perceive other possibly existing dimensions of time, humans have developed the notion of space-time, its curvature and the concept of an endless curvature of space-time in the middle

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of a black hole – from which a new universe may develop, or has developed, via a wormhole. Other universes humans do not perceive. They can even be around us. In such universes more developed beings than humans may reside. They may be super-intelligent.[6]

Conclusion

As a consequence of what has been discussed in this paper, the solution to the Fermi paradox, but also to various other phenomena humans cannot explain, can be found in the possibility that humans are incapable of perceiving a variety of other dimensions of space and especially time, as well as other universes which exist without humans perceiving them. Hence, the Fermi paradox is a paradox only from an anthropocentric epistemological perspective.

It is notable that epistemological anthropocentrism has succeeded to pervade solutions to the Fermi paradox, that is, largely abstract themes from the domain of philosophy and theoretical physics. This only shows that anthropocentrism has had an influence on not only 'village idiots', but that in certain cases it had a certain influence on the greatest minds humanity has produced.

The formulation of the Fermi paradox is actually too narrow. The paradox is indeed why humans have not perceived extraterrestrial life in a universe that is enormous, but the question is much broader: what may exist around humans that humans cannot perceive ('around' meaning both terrestrial, extraterrestrial in our universe, as well as extraterrestrial in other universes)? That is the key question. The Fermi paradox is only an anthropocentric formulation of one aspect of this question: an anthropocentric formulation of the phenomenon that humans are not capable of observing possibly additional dimensions of space and time, that their perception of space and especially time is therefore flawed, and that humans are incapable of observing additional universes.

Hence, the Fermi paradox should not be solved in a manner resembling previous attempts at solving the paradox, but it should be addressed in line with what has been termed in this paper as the *lasting human epistemological limitations solution*. In fact, the paradox should be reformulated. It should be formulated in the context of highly limited human epistemological capacities.

Immanuel Kant was perhaps the most influential philosopher who has extensively elaborated on the issue of limited human epistemological capacities. He conceived of space and time as of 'a priori forms of apperception' humans need in order to make sense of the world around them, although reality ('the thing in itself' – '*Ding an sich*') will remain unknown to the human.

A few centuries after Kant, we can only note that humanity still struggles with the same difficulty, and that it will likely struggle with it as long as (post)humans do not develop new modes of perception. On a more optimistic note: a little more than 200 years after Kant, a number of theoretical physicists and philosophers have arrived at a better understanding of Kant's epistemology, that is, at a better comprehension of the role of Kant's a priori forms of apperception: new conceptions of space and time have been developed, although they have not been reflected in the solutions to the Fermi paradox.

Nonetheless, that is highly likely to change in the future. Somewhat more than 200 years after Kant's death the concepts of his a priori forms of apperception, notably time and space, have been revolutionized in theoretical physics and philosophy. The relativity of time, the conception that time even does not exist, the replacement of time and space with space-time, the curvature of space-time, the concept from quantum physics that the same object can exist at the same time at different locations, and for our purposes most importantly, the notion that the curvature of space-time in the middle of a black hole is unlimited and that this provides the opportunity for the development of a new universe, are immense breakthroughs in human thought. There is no reason to believe that in the future this breakthrough will not be reflected in the resolutions to the Fermi paradox. These resolutions are about to become increasingly non-anthropocentric.

[6]It deserves to be mentioned that, although the approach in this paper is apparently original in scientific literature, there are precedents for it in science fiction literature, most forcefully elaborated in Adam Roberts's witty but thought-provoking novel 'The Thing Itself' (Roberts, 2015). I am thankful to an anonymous reviewer for noting this.

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