

Author: Danielle Mortensen

Title: Knocking on the Stars: The Philosophical Implications of the Search for Extraterrestrial Life

Research Summary:

This paper takes a philosophical approach to addressing the question: Is humanity ready to search for extraterrestrial life? This paper analyzes the distribution of resources and argues that SETI should not be a priority in terms of funding. The paper then talks about assumptions that we make in our search for ET life, including SETI's definition of intelligence, searching at 21 cm wavelengths for signals, and that life forms have not traveled from their host planets. The paper then addresses our First Contact protocol, or lack thereof, and flaws that are present. Lastly, the paper addresses World Peace, and how this is necessary to achieve in order to begin the search for life.

Recommendation: Accept with major revision

This paper does present an interesting moral dilemma in our search for extraterrestrial life and is an interesting topic. However, there are a lot of instances where the arguments may not be entirely sound or clear, compromising the integrity of the paper.

Concerns:

Major points:

- The abstract and intro mention arguing that science and philosophy go hand in hand. However, this is not addressed in the rest of the paper other than for a couple sentences at the end of the conclusion. These sentences should be left out of the paper because they do not seem to contribute to the main argument of the paper.
- The paper uses a lot of colloquialisms and contractions. While this is a stylistic choice, it does make the paper should a bit unprofessional and compromises the merit of the paper.
- This paper would benefit from the use of counterarguments to strengthen the main argument. There are a couple places where the author assumes that people agree with their argument, with phrases like "assuming most people would answer 'yes'." Rather than this, counterarguments should be presented, and then disproven, to persuade the reader to agree.
- There are a lot of places where citations are needed, for example, when referencing distribution of US dollars or referencing books or movies. Also, some of the references are not from academic sources, this detracting from the merit of the paper. For example, the Drake Equation was cited in a *Physics Today* article. Why was it not cited from the original source material?

The Question:

- “A definition of ‘intelligence’ is also quite difficult.” Then the author proceeds to define it. This sentence drastically takes away from the integrity of the paper and trust the reader has in the author.
- The last paragraph of this section seems to shift the goal of the paper. The abstract talked about demonstrating why humans are not ready to search for ET life, but this paragraph talks about proving that world peace and technological advancement are necessary in order to search for ET life. It seems like this paragraph might need to be rephrased in order to better fit the narrative.

SETI and the Distribution of Resources:

- This paper is aiming to show that world peace and technological advancement are necessary for us to be ready to search for ET life. However, the paper talks about seemingly unrelated areas. The only related subsection in Section 3 is “World Peace,” and technological advancement is not mentioned. Maybe the paper does not need to be completely rewritten, but the other sections could be restructured into a “Technological Advancement” section.
- “Our current technology is nowhere near advanced enough to search for every kind of life, in every kind of way, and in every direction of the Universe.” Is this saying that, just because our technology is not perfected, we should not pursue searching for ET life? Isn’t science about using our current understanding to test and experiment, even (and especially) if that understanding is not perfect? I feel like this creates a really big hole in the argument, unless I am misunderstanding what the author is trying to say.
- “SETI bases their search on many assumptions.” However, the author also made assumptions in defining key terms, such as assuming humans are the only intelligent species on Earth by definition. The search for ET life cannot be considered bad because it is based on assumptions; it is simply based on our current understanding of the universe. For example, scientists assume that the laws of physics work everywhere in the universe, but we cannot prove this, and unless we find a counterexample, we will assume that this is true. This does not make the assumption bad or invalidate all of physics, and definitely does not mean that the study of physics is futile. (This is not to say that the whole paper needs to be rewritten or re-thought, but this argument could be used as a counterargument that the author can expand upon and argue against to strengthen the paper.)

Our Assumptions:

- “SETI, in particular, tends to narrow their definition of intelligence.” This is a “narrow” definition because the author arbitrarily defined intelligence to be something different earlier. However, if the author decided to define intelligence in the same way that SETI does, then this definition would not be narrow, and the argument would fall apart.

Conclusion:

- “This can only be answered with more questions which are ultimately up to you to decide.” This severely detracts from the merit of the paper and the trust placed in the author. This essentially detracts from the whole point and argument presented in the paper because it does not matter if it is up to the reader to decide.

Minor points:

- Paper should be in AAS format.
- The author uses “we” and “us” (plural) when there is only one author on the paper.
- There are a few sentences throughout the paper that are phrased as questions, such as “If there are so many alien life forms, then why don’t we see them?” These sentences give the paper a colloquial tone. However, they might be okay in a philosophy setting, I’m not entirely sure.

Introduction:

- “Will change the course of human philosophy, history, ethics, religion, astronomy, biology, chemistry, technology, and arguably every other aspect...” If all aspects of humanity are affected, there is no need to list these off.
- “So far, the search for life seems promising.” It should be clarified what this is based on (e.g., probability).
- Paragraph 3 mentions characteristics of exoplanets necessary for life. All of the characteristics mentioned are explained except for the presence of gases such as methane, ammonia, etc.
- The Drake equation should have an equation number.
- The first few parameters are about 0.1, but N is about 10,000. Do these values make sense considering all the other parameters in the equation except for L are fractions? Is L sufficiently large to make $N = 10,000$?
- “The range varies by opinion.” Is this based on opinion, or on observations/estimations?
- “The presence of Science Fiction in popular literature...” then the paragraph proceeds to mention, TV shows and movies as well as literature.

The Question

- The title of this section does not seem to accurately represent the content. Maybe it should be changed to something like “Definitions”?
- The first paragraph of this section can be moved to the introduction.
- “There are notable issues with this Darwinian definition of life...” What are these issues?
- “But the question of intelligence becomes more convoluted when we consider octopi, apes, dolphins, and other rather brainy animals. Do they fall under the definition of intelligence?” The answer to this is almost immediately answered as “no,” so this section is unnecessary.
- “Humans, we shall say, are the only creatures on Earth under this category of intelligence. Although this cannot be proven.” Why are humans the only

intelligent beings? If the author is assuming this to be true, it should be stated that this is an assumption and that humans are taken to be the only intelligent species on earth. Otherwise, this claim needs textual support.

- “The term ‘First Contact’ was initially made popular in the context of extraterrestrials by Murray Leinster's 1945 Science Fiction book, *First Contact*. It is used to refer to the initial communication between humanity and extraterrestrial life.” Immediately after, a different definition is given. So, these sentences are unnecessary.
- The author lists sources of communication that are not considered First Contact, specifically “the physical discovery of evidence of an extinct alien civilization” and “Earth messages intercepted by alien civilizations” Then the author says, “Essentially, if intelligent extraterrestrial life is made known to us somehow, then this is ‘First Contact.’” However, aren’t these examples also ways that intelligent extraterrestrial life can be made known to us?
- The example from *Galaxy Quest* is unnecessary. It does not need to be explained why intent is important.
- “We are creating a rapidly deteriorating timeline by which we limit humanity through the focus of resources on non-essential projects.” This sentence is unclear and should be reworded.

SETI and the Distribution of Resources:

- “It is possible that by discovering and initiating contact with intelligent extraterrestrials, we may gain access to additional resources.” This is a good counterargument, but it should be explained more and expanded upon.
- “It is preferable to avoid causing harm to humanity altogether (by postponing First Contact inasmuch as we can) than it is to take the chance that resources (with no caveats) would be gained through extraterrestrial interactions.” Why is this the case?

Our Assumptions:

- This section can be placed earlier, after defining key terms, to keep all of the background information together.
- “The range of possibilities for means of communication is just too large for us to cover.” Does this really mean that we should not try at all to communicate?

First Contact Protocol:

- “When it comes to the unknown of extraterrestrial life, anything we can imagine is possible, even to the far reaches of Science Fiction.” This sentence can be deleted because, once it becomes possible, it is no longer Science Fiction.
- One parallel that could strengthen this section would be colonization. If we were analogous to the Europeans in this case, it could be argued that the Europeans weren’t ready to colonize America, hence all the issues that arose. Conversely, if we were analogous to the Native Americans, contact

between the Europeans and Native Americans resulted in a lot of harm done to the Native Americans, like what could happen to us.

World Peace:

- The term “peace” might be best defined in the “The Question” section.
- To offer another counterargument, the Space Race resulted in a lot of technological advancements that benefited society. It did not necessarily result in the detriment of humanity, but maybe had some good outcomes. (Note that I am not too well versed on the history of this and could be wrong.)
- “They learned the concept of war and destruction from us.” Just because we teach this civilization about nuclear weapons, does not mean we teach them what war is. War was a concept and quite prevalent on earth before nuclear weapons were introduced. In fact, nuclear weapons were only used in war once, and its purpose was to end a war.

Conclusion:

- A summary of the thesis and arguments presented should be given.
- The questions listed could be stated as “future work” to be investigated in later research.
- The mention of the Mount Everest Effect is not necessary to the conclusion. No new concepts should be introduced here.

Evaluation of Criteria:

Is the length appropriate?

The paper is long and has a lot of unnecessary references, especially to Science Fiction. These do not necessarily strengthen the argument or provide clear examples. Cutting these out of the paper will reduce its length.

Are the title and abstract sufficiently informative?

“Knocking on the Stars” does not make a lot of sense. “The Philosophical Implications of the Search for Extraterrestrial Life” seems vague and should be more specific. The abstract provides a good introduction to the paper, but the last sentence is unnecessary and does not relate to the topic of the paper.

Is the contribution to science significant?

Yes, this paper presents an interesting take on the search for ET life.

Is level of English adequate?

The level of English is easy to understand but is unclear in some places. Also, it has a colloquial tone, which detracts from the integrity of the paper and the merit the author has.

Is the literature properly cited?

There are many places where literature should be cited but isn't, especially when referencing movies, books, or real-world examples (like Notre Dame). Also, some of the literature cited are not from academic sources, such as a *Physics Today* article, detracting from the merit of the paper.

Are the results clearly and accurately presented?

No, the argument presented is difficult to follow, and a conclusion or summary is not given. This makes it difficult to see what the results actually are.

Is the topic appropriate for the journal?

Yes, the topic is appropriate for the journal.

Data Management Plan:

The results presented in this paper are reproducible and can be achieved by following the argument presented in the paper.

Additional Comment: I know that the comments above might seem daunting, but I want you to know that your paper is really interesting! I don't want you to think that your writing isn't good or anything like that, but I think upon resubmission, your paper will be amazing!

Peer review report

Title: Knocking on the Stars: The Phial Implications of the Search for Extraterrestrial Life.

Author: Danielle Mortensen

Summary

The study explains and provide arguments for the author's disagreement to the question "*Should we be searching for intelligent extraterrestrial life?*" To bring the consensus between the readers and the author's perspective, the author gives clear definitions on key terms such as "life", "intelligence", "non-intelligence", "First Contact", and "communication". After setting a common ground to understand the key concepts, the author provides four arguments to support her thesis: the distribution of resources, our assumptions about extraterrestrial life, the first contact protocol, and world peace. Firstly, the author argues that money should be distributed to more important world issues such as poverty or environmental pollution, rather than being donated to SETI to search for aliens. Also, the technology is not advanced enough for us to search effectively, leading to a possible waste of money. In the second argument, at the moment, humans make a lot of assumptions while looking for extraterrestrial life. For example, we assume that intelligent life will send out electromagnetic signals to space, or we assume that it will send out the wavelength of 21-cm. Furthermore, we assume how extraterrestrial life look like based on our life on Earth. Thirdly, humanity does not have yet a protocol on what to do when First contact happens, which can brings confusion and chaos to the world. Last but not least, the author believes that Earth world peace is a must for us to begin search for other life. She argues that we are responsible to the moral value that we convey to or influence the alien civilizations. The author also emphasizes that peace is the only means of going into First Contact with a clear conscious and pure intent. To conclude, the world is only prepared for the search of other intelligent life once it has the answer for the examined arguments.

Recommendation: accepted with minor revisions.

Justification

a. Major points

- Introduction:
 - "*When a neutral hydrogen atom's electron moves from its excited state to the ground state, it results in a 21 cm wavelength photo.*": the 21 cm wavelength does not come from the change in energy between the excited state and the ground state, but rather the change in energy between two types of spin configuration within hydrogen atom.
- World peace:
 - "*If this is still unconvincing, suppose it is ... create this situation for other civilizations?*": part seems to discuss more on "war on other civilization" rather than "world peace". The author should rephrase the paragraph to link these two concepts together. For example, if our First contact is with an aggressive civilization, humanity may not have enough weapon or resources to go against it because humanity is not

even united at this moment. I think the author should include/ consider this point in her argument.

b. Minor points

- Introduction:
 - *“These characteristics include a relatively circular orbit ... and the presence of carbon”*: there are more things that are necessary for life, such as the need for terrestrial planets or oceans, being far away from any dangerous irradiative sources, etc. Thus, I suggest the reader to put the phrase “including but not limited to” to cover a wider range of requirements for life.
 - *“... by stellar activity such as coronal mass ejections and flares”*: the Sun (which I think can be considered a stable star in this context regarding life) also has coronal mass ejections and flare. Thus, I think the more important point is the distance between the planets and the star to avoid such activities, or those activities need not to be too frequent.
 - *“Many suggestions have been made to estimate N”*: need citation.
 - *“We observe the presence of organic matter ...”*: how is this a form of communication of intelligent life? Organic matter can be observed in non-intelligent life, or even interstellar medium.
 - *“... but it has generally been concluded that ... in the 21 cm wavelength”*: need citation.

- The Question
 - *“... and other brainy animals.”*: what are “brainy animals”? Instead of introducing more undefined terms, I think the author should only lists octopi, apes, and dolphins.
 - *“According to some, death cannot be taught”*: who or what are “some” referring to?

- SETI & The distribution of resources
 - *“... many millions of dollars go to SETI ...”*: if possible, the exact value of donation to SETI should be included, or at least a citation is needed for the claim that it is “millions of dollars”.
 - *“... addressed with this money [SETI Institute (2021)]”*: The citation seems to be put in a wrong direction (right now, it seems to support the statement that “such prominent world issues could be addressed with this money”. Should it comes in the middle of the sentence?
 - *“... our current technology is nowhere near advanced enough to search for every kind of life ...”*: this should be the author’s first and more important point in the section. I think there are always social problems that need to be addressed. Therefore, if we follow the author’s argument in the first paragraph of the section, it seems like we should never put money in the search. Rather, I think the more important point is that if we decide to put money in, we should know what we are doing and that the technology is advanced enough. Thus, I think this point should come first, and the argument about spending money on other social problems can come second.

- *“This is very similar to the plot of Dune ... to control this resource”*: I don’t think the argument in this paragraph needs an example from movie to illustrate. The logic in the following sentences is enough.
- Our assumptions
 - The author should make the title of this section clearer. For example, it can be “our assumption about technology and life”.
 - *“There is no reason to believe that light is the best way of sending messages for other civilizations”*: I think that we have some reasons, because nothing travels faster than light. This claim is too definitive for me.
- First contact protocol
 - *“When it comes to the unknown of ... of Science Fiction.”*: I think this sentence distracts from the discussion about the need of the First Contact Protocol. Also, the term “limitless possibilities” in the following sentence should be enough to convey the idea of this sentence.
 - *“Despite their detailed laws, it is still difficult to enforce...”*: the author should explain why it is difficult, or what prevents the laws from being agreed among nations.
- Word peace
 - *“If this is the case, there is no need to keep weapons of mass destruction because there is no rivalry between these groups of people”*: is it reasonable for humanity to keep weapons of mass destruction to defend ourselves with aggressive extraterrestrial life? I think the answer to this question can be helpful, or else the term “no need” may be too definitive.
- Conclusion
 - *“... which are ultimately up to you to decide...”*: the author should address “us” or “humanity” rather than “you”.

Evaluation

The length of the paper is appropriate and the topic is appropriate for the journal. Regarding the title, the part “Knocking on the Stars” seem unrelated to the focus of the study, thus I suggest that the author should remove that. Also, I think the title should include “Intelligent Extraterrestrial Life”, rather than just “Extraterrestrial Life”. The abstract conveys the content of the study. The contribution to philosophy science is significant, as there are not many debates about this question right now. The English in the paper is easy to follow, however, there are some colloquial that I am not sure if they are acceptable in a philosophy paper. Also, some citations are missing in the paper. The result, especially the conclusion section, is well stated. Since this is a philosophy paper, there is no comment on the Data Management plan.

All my comments are constructive reviews and sometimes they can come from personal preference or personal experience. Please understand if I misunderstand the author in some points. Also, please send my congratulation on the author's work and I enjoy reading the paper.

Author: Danielle Mortensen

Title: Knocking on the Stars: The Philosophical Implications of the Search for Extraterrestrial Life

Summary:

- This paper discusses the philosophical reasoning why humanity is not ready for first contact. After an in-depth introduction discussing the previous science on the search for extraterrestrial life, the paper begins by posing the main question. The main question posed is, "Should we be searching for extraterrestrial life." To answer this question, key definitions are listed, including the definition of life, intelligence, non-intelligence, first contact and communication. Many of these terms do not have strict definitions, but the author makes clear what the distinctions are in the context of this paper. Next, the author presents the argument as to why humanity is not ready for first contact. SETI and resource distribution is first discussed. It is argued that the large sum of money donated to SETI could be better used to help the Earth. The comparison to Notre Dame makes this argument very clear. Next the paper discusses certain assumptions made for the argument. This includes previous assumptions made to solve the Drake equation. This section details the difficulty in narrowing down the search for extraterrestrial life. Next the first contact protocol is discussed. This demonstrates how humanity is not unified in the search for alien life and leads to the argument for world peace. World peace must be achieved before first contact is made. If not, first contact could lead to death and destruction and ultimately end human life or the alien life. In the conclusion, a review is

given in the form of a list of questions that must be asked for first contact. Because the answer to these questions is no, humanity is not ready for first contact.

Rating: Accept with Minor Revision

Minor Revisions

- In the introduction, the scientific reason for potential life in the solar system should be explained. There is a good explanation into the science behind the conditions for life on exoplanets, an explanation like this should be given for the solar system as well.
- When discussing the definitions in Section 2, do other philosophical text adopt the same definitions? It would add merit to the use of these definitions if other studies also adopted them.
- There should be more in-depth discussion of what SETI does and how it uses donations in the beginning of section 3. Therefore, the reader can appropriately gauge whether all these donations to SETI are deserved or not. It should also be mentioned how much SET receives in donations
- In section 3.2, it is stated that “there is no reason to believe that light is the best way of sending signal at all!” This should be elaborated on. Our current understanding of physics seems to refute this statement as light is the fastest moving thing in the universe. Does this statement assume our current knowledge of physics is incorrect or incomplete?
- In Section 3.4, the space race was technically between the U.S. and the Soviet Union, Russia was a part of the Soviet Union.

Major Revisions

- There needs to be an affiliation added for the author.
- In section 2, it states “Humans, we shall say, are the only creatures on Earth under this category of intelligence”, in reference to humans being the only species which have a concept of mortality. This needs a citation.
- Some of the scenarios seem outlandish. For example, in section 3.3, it is described how there are no laws preventing an individual from convincing an advanced alien species to wage war on the rest of Earth. This assumes first contact comes in the form of an alien race coming to Earth with advanced weaponry. It seems more reasonable that first contact comes in the form of detection of an alien race located very far away. Throughout the paper, there is reference to disastrous scenarios presented in science fiction books and films. In my opinion, using real world examples makes a better argument. The Notre Dame comparison was very effective compared to theoretical sci-fi plots. Examples pertaining to the colonizing nature of humanity would be a good addition instead of focusing on sci-fi stories depicting alien domination.
- There needs to be a better formulation of the argument for advanced technology. There needs to a definition of what advanced technology is. What do we need to advance to become ready for first contact? Also, it is unclear where the argument for advanced technology is in the paper. There is not a separate section for this topic. It is mentioned in section 3.1, but the discussion seems covered with mention of *Dune* and theoretical water-loving aliens. There needs to be a better formulation of this argument and it needs to be clear to the reader where the advanced technology argument is. Compared to the world peace argument, there was nice flow from section 3.3 into section 3.4 which

develops the world peace argument. This needs to be done for the advanced technology topic.

Evaluation of Criteria

Is the length appropriate?

- Yes, the paper provides an in-depth discussion of all the topics

Are the title and abstract sufficiently informative?

- Yes, the title is catchy and informative, and the project goals and results are stated in the abstract.

Is the contribution to science significant?

- Not necessarily. This paper is not a scientific text. There is not a heavy influence on the science of searching for alien life. This could be improved with a greater discussion on the science behind potential life in the solar system, as discussed above. But in the end, this is not a scientific text and is a philosophical reflection

Is the level of English adequate?

- Yes, however, watch out for contractions. They should typically be avoided.

Is the literature properly cited?

- There could be a greater reference to other philosophical texts related to this topic. Mainly when the definitions (section 2) and the assumptions (section 3.2) are discussed. It would give merit to the definitions and assumptions used if other studies adopted similar definitions and assumptions.

Are the results clearly and accurately presented?

- Yes, in the conclusion there is a good overview of the results in the form of a list of questions. The world peace argument is well formulated. As stated earlier, the advanced technology argument could be presented better. The need for advanced technology is a major point of the paper and is stated in the abstract. Therefore, this argument needs to be really strong and clear to the reader.

Is the topic appropriate for this journal?

- Yes

Data Management Plan

- There are no numerical results for this study. The qualitative results are clearly mentioned in the text

Additional Comments:

- This study was very interesting and thought-provoking. I would like to thank the author for all their hard work in preparing this paper.

Summary:

This paper provides a philosophical approach to the question of *should we be searching for intelligent extraterrestrial life*. The paper starts with an introduction about how life is expectedly common in the universe and yet rather difficult to achieve and not yet discovered by humans. The introduction also describes the possibilities already used to both listen and communicate with intelligent life as well as the prevalence of the topic in popular culture. The paper then defines several terms that are to be used throughout the paper: life, intelligence, non-intelligence, First Contact, and communication. The discussion then turns to the topic of preparedness. The first argument made is on the topic of SETI and the distribution of resources. The author argues that while projects like SETI are “sexy”, they hold little in the line of merit or feasibility for success. Additionally, the author addresses the possibility that communication with an alien species will result in our moral need to help a distressed civilization by sharing resources that we are already limited on (fresh water). The paper next addresses some of the bold assumptions that we as a species make in the consideration of alien life. These assumptions include the connection between intelligence and technological advancements, the use of light as communication, the assumption that aliens are even sending signals, and the assumption of what intelligent life even is. The First Contact protocol is addressed next, or rather the lack of a worldwide protocol. The last major point the author stresses is the concept of world peace. We cannot, the author claims, search for intelligent life if we can’t even take care of life here on earth. Another assumption mentioned here is the assumption that aliens we encounter will not be hostile towards us and try to dominate our planet. The paper concludes with a series of summarizing questions for the reader to consider.

Recommendation:

Accept with minor revision

Points of Consideration:

Major:

None

Minor:

§2 does not seem to be addressing a question. Mostly seems to be definitions. Could be renamed or restructure

§3.3¶2 might not be a good idea to be explicitly calling out certain groups (Russia) in a scientific paper

Elements of life are talked about in the introduction but are not referenced in the broader paper

Conclusion does not address how paper worked to say we are not prepared to encounter intelligent life. Rather it asks questions for the reader to determine on their own. A restatement of the author’s stance would be useful here

Evaluation:

Length:

Length is appropriate

Title and Abstract Sufficiency:

Both title and abstract sufficiently describe the research conducted

Contribution to Science:

Paper provides a philosophical analysis of why we should not be searching for intelligent extraterrestrial life. This is more relevant today with the advancements of technology and the rapidly deteriorating state of our own planet.

Level of English:

Paper is easy to read, and language used is understandable

Literary Citations:

All credit is given where due

Clarity and Accuracy of Presentation:

All points are clearly laid out with relevant connections and explanations. The philosophical argument is supported with sufficient scientific claims

Topic Appropriate for Journal:

The topic of this paper is appropriate for this Journal

Data Management Plan:

Any data used is publicly accessible and paper will be accessible to general public as well

Additional Comments:

This paper is very well constructed. The presentation of necessary background information as well as the necessary information, connections, and conclusions are all well made. In the hope that the author accepts these comments, I accept the author's work and compliment them on their hard work and results. My strongest compliments to the author.

Title: Knocking on the Stars: The Philosophical Implications of the Search for Extraterrestrial Life

Author: Danielle Mortensen

Summary: The author begins by listing the many areas of human life that finding new life would affect. She then delves into the progress humans have made in the search for other life. This progress in the search for life includes the Fermi paradox, which questions why we do not see other life, and the famous Drake Equation, which estimates the number of extraterrestrial civilizations with the ability to communicate with humans. Science fiction plays a role in shaping human perception of these questions as well. After defining important background terms, the author claims that humanity is not prepared for First Contact. She argues that the two primary conditions for preparedness are world peace and advanced technology. The paper also focuses on the Search for Extra-Terrestrial Intelligence (SETI) by analyzing the risks and potential benefits of a possible First Contact from the search. She explains how we will need to work together amongst nations if this search becomes successful. She reiterates of these arguments in a series of questions that illustrate humanity's unpreparedness for finding intelligent extraterrestrials. The study serves an example of the need for philosophy and ethics in science.

Recommendation: Accept after major revisions.

Justification of Recommendation:

Major points:

- The arguments made throughout the paper could be strengthened by more evidence, such as statistical studies. For example, section 3.1 states that “many people have given up on the idea of saving the Earth and have turned to the alternative of space as an end-all solution to our problems.” Are there any statistics or references available to back up this claim?

Other necessary clarifications include:

- o Is the assumption that most people would answer “yes” (to the question stated in the first paragraph of section 3.1) representative of real life, or is it an assumption made for the sake of strengthening the authors argument?

- In section 3.3, the author states that many nations (in addition to Russia) are guilty of misdemeanors related to local space travel then does not provide an explanation or references to support this claim.
- It is unclear if the definition of world peace in section 3.4 is the author's own definition or one based on other philosophical papers.
- An important question seems to be: what would make us ready for First Contact? Then, a large portion of the paper focuses on our insufficient technology. By asking about our readiness for First Contact, does that already imply that we have successfully made first contact? The abstract and the last portion of the introduction set up the paper as though the author plans to tackle what would happen assuming First Contact did occur.

Minor points:

- The author thoroughly explains the Drake Equation, but she could include an explanation of possible answers to Fermi's paradox.
- The author references the SETI post-detection protocol without providing any description of what that protocol entails or why that protocol is not legally enforceable.
- Section 3.4 states that Russia and the U.S. raced each other to get to space and the moon for the "purpose of expressing power, control, and superiority" rather than "technological advancements and growth of humanity." The author does not provide a reference to support this claim.
- The author concludes the paper with a quote about science and philosophy without any source for the quote. It is unclear whether the quote is the author's original quote or from another source.

Evaluation:

1. Is the length appropriate?
 - a. Yes – the length is appropriate, but some parts could use a more in-depth explanation (see justifications above).
2. Are the title and abstract sufficiently informative?
 - a. Yes – both the title and abstract are sufficiently informative.
3. Is the contribution to science significant?

- a.* Yes – it is important to recognize the bridge between philosophy and science.
- 4. Is the level of English adequate?
 - a.* Yes – the level of English is adequate.
- 5. Is the literature properly cited?
 - a.* No – many claims made throughout the paper seem as though they need a reference (see comments in the justification above).
- 6. Are the results clearly and accurately presented?
 - a.* The study does not have scientific results. However, the author clearly presents all argument and conclusions.
- 7. Is the topic appropriate for this journal?
 - a.* Yes – the topic is appropriate for this journal.
- 8. Data management plan?
 - a.* The mentions the next question and the importance of studies involving both philosophy and science.

Additional Comments: Kudos to the author for combining two fields into one study. This must have required a lot of time to work out the philosophical reasoning behind each argument, and she demonstrates a strong ability to take on that challenge.

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Title: Knocking on the Stars: The Philosophical Implications of the Search for Extraterrestrial Life

Summary:

The author includes an overview of what scientists have uncovered when they ponder the questions *Are we alone in the Universe?* One avenue for this issue are exoplanets and the author goes in-depth as to why they are so important and what qualities would be required so the exoplanet can be considered habitable. Aside from exoplanets, the author brings up two concepts within astronomy that are centered around the probability of extraterrestrial life: the Fermi Paradox and the Drake Equation. Outside the realm of reality, the author explores how popular media has depicted a potential encounter with extraterrestrial life. A series of scenarios are then explored, but not before definitions are given to important terms such as “life”, “intelligence”, and others. The scenarios are then provided, each one focusing on a different philosophical idea. In the end, the author concedes that as of now, it is not possible to answer the big question and instead, it only serves to generate smaller yet equally important questions.

Recommendation: Accept with minor revisions.

Justification

Major Points:

- While some of the scenarios the author proposes make very good points, there were others that did not have the same effect. More specifically, it was the real-life examples that the author presented that really struck home in contrast to the made up scenarios that were included.

Minor Points:

- Though understandable for this study, perhaps the author could include some visuals for the audience. The amount of text in this study, while impressive, can also deter some readers from reading the entire paper.

Evaluation:

1. Appropriate Length

- a. Yes, the length of the paper is appropriate.
2. Title and Abstract
 - a. Yes, the title and abstract are sufficiently informative as they briefly and efficiently encapsulate what the project is about.
3. Scientific Contribution
 - a.
4. English Level
 - a. Yes, the level of English is adequate.
5. Literature Citation
 - a. Yes, all of the literature that has been cited has been done so in the correct manner.
6. Results Presentation
 - a. Due to the nature of the study the author has conducted, the results are actually the several scenarios the author has proposed throughout the paper. As a result, no single scenario can be classified as a result. Perhaps this can be mentioned in the author's abstract?
7. Topic
 - a. Yes, the topic is appropriate for this journal.
8. Data Management Plan
 - a. As mentioned before, due to the nature of the study, a data management plan would not work for this study.

Additional Comments: This study has been one of the most interesting by far as it efficiently combines both astronomy and philosophy. All the scenarios were very interesting to read. Well done!

Summary

The author begins by talking about the likelihood that we actually find life elsewhere in the universe. She goes into detail about the Drake Equation and starts to discuss why we have not yet found any life. Then she introduces the impact that science fiction has had on our perspectives of alien life and how it plays a key role in bridging our understandings of science and philosophy. After the introduction, the author introduces the main topic that this paper focuses on, a discussion of how we should not be looking for ET life. She defines many different key terms so that we can understand from what perspective she is looking at this topic. Her next section then gets into the main points of her argument. We first must consider how we have limited resources on Earth and that interacting with ET life might force us to have to share with them. The author also considers assumptions we make about life and how it is possible that we might really have no idea about the life we can actually encounter. She then talks about how since there is so much disagreement between nations, it is incredibly difficult to establish a protocol for when we first come into contact with ET life. Finally, she talks about how human nature itself might not be ready for the search. Nations are constantly at odds with each other and until we achieve peace in that sense, it does not make much sense to try to search for and achieve peace with other beings. The main idea I understand from this argument is that there are so many factors that go into preparing ourselves for the first encounter we have with ET life and that there is so much about the potential life itself that we have not yet considered, including what our impact on it may be and vice versa. There is no way we can be prepared for this at least in the near future, therefore, we should not be bothering ourselves with it at the moment.

Recommendation

Accept with major revision.

Justification of Recommendation

Major points:

1. It seems like the idea that science and philosophy are linked is a big part of this paper. However, I am confused about how this is related to the author's main question of if we should be searching for ET life. Do we need to actually bridge science and philosophy in order to search for ET life? Why are these two topics connected? Also, this idea is not really mentioned at all in the paper besides twice in the beginning and once in the conclusion, so I am unclear regarding how big of a part of the essay it is supposed to be.
2. There are many instances where I think there is a lot of fluff in the paragraphs that is not necessary. For example, are the numerous extensive paragraphs defining all those key terms necessary? Or, can they just be briefly defined as the author goes along explaining her main argument? Another example is the description of De Anima by Aristotle. I think the description of the soul is not necessary and that she could just mention rational thought and have the reader have the same understanding. Fixing some of these parts might make the paper more concise.
3. I am not sure about what the point of the My Assumptions section is. I do not understand how it contributes to the main argument about how we should not be searching for ET life. I believe that it is talking about the assumptions of the Drake Equation, and while that is interesting, I do not see how it plays a role in the argument.

4. In the first paragraph of World Peace, the author says that “Maybe if world peace were the case, we could get on with discussing options for First Contact protocol.” This is just one example of many in this paper of the fact that even though it is an interesting thought, a thought is all it seems to be. Many points need to have additional explanation so that the paper seems like it is more researched-based rather than something which is pondered.
5. Regarding the Conclusion, I am not sure if that is the best way to end a paper, no matter what category it falls under (scientific or philosophical). A research paper is supposed to convince the reader of something with evidence. I don't think that telling the reader that they need to decide on their own what to believe is very convincing of the argument.

Minor points:

1. I am not quite sure about if the citation format is standard for research papers.
2. There are a few instances throughout the paper where I think citing literature is necessary. For example, the author states that “the presence of certain molecules like H₂O are important because water is a universal solvent which aids in life processes on Earth, and elements like carbon have a large and strong structure which is also ideal for life.” Where did this information come from?
3. When talking about the Drake Equation, the author says that observing the presence of organic matter is a form of communication, but I do not understand how this is the case.
4. At the end of page two, the author says that “it is assumed that other intelligent life will come to the same conclusions and also tune their instruments to 21 cm.” This is a rather large assumption and I think it should be explained more.
5. There is a lot of language that takes away from the professionalism of the paper. It almost seems like the author is trying to add an element of humor, but I do not believe that is the right move for a research paper of any type. It makes it sound more conversational than professional. For example, the author uses: “brainy,” “laymen terms,” “suss out,” and “sexy.”
6. There is a lot of language that makes me think the author is not completely sure of her argument, which causes me to not have a lot of confidence in it as well. For example, the author uses the word “maybe” quite often.
7. I have one concern about the intelligent life definition. The author defines what intelligent life is, but how do we actually know if it is intelligent? How do we know if the life we find is aware of its own morality? It is highly unlikely that we can simply ask them this.
8. Regarding all the references to the movies, like Galaxy Quest or Star Trek, is it acceptable to assume that the readers have seen the movies that are being referenced? Also, is the whole movie explanation even necessary? I haven't seen any of the movies that are referenced in the paper and I understood the point the author is trying to make just the same, so I think that it is possible to get right to the point without wasting sentences on the movies.
9. I think the last paragraph of The Question section would be a good introduction paragraph to The Argument section.
10. Why would most people answer yes to the question about if money would have more return for the human race if it was put into far more pressing issues than the search for alien life?

11. Why have many people given up on the idea of saving Earth?
12. The author talks about how people who donate to SETI are not donating to the right place because the technology does not yet exist to search for intelligent life. However, unless we throw money at these projects, how will the technology ever become advanced enough?
13. In the paragraph right before the Our Assumptions section, the author talks about gaining or losing resources. She says that between the best and worst case scenarios, we should avoid First Contact so that we do not cause harm to humanity. How does the author know what the odds are of either the best or worst case scenarios occurring? Is the author trying to say that even though the odds of the worst case scenario happening are very low, its effects would be so drastic that we shouldn't risk anything at all? I think that this argument should definitely be developed a little more.
14. There is a certain sentence in My Assumptions that says: "This is not so outrageous an idea-that a civilization, perhaps millions of years older than us, has found meaning in life through the abandonment of technology." I think that this cannot be a standalone statement and that it should be explained more. There is so much to unpack with this idea and the author should not just gloss over it if she wants to include it.
15. In the last paragraph on page 5, there are many separate ideas that seem to be quite vague. I understand what is trying to be said, but in getting the point across, the author is presenting many new ideas that should be backed up by evidence or additional explanation.
16. In the last paragraph before the World Peace section, the author says that we cannot search for ET life because we have not even handled discrepancies amongst ourselves yet. But, who is to say that this won't happen soon? Maybe to make a stronger argument, the author should talk about how she has no confidence that the world will come to an agreement any time soon or before the time comes where we make first contact, no matter how far in the future that is.
17. Regarding the World Peace section, what if we achieve world peace but then with First Contact it is ruined? What happens then? Is that another point we must consider?

Evaluation

1. Paper length
 - a. I think that the paper is too long. There are many sections where extra description is not needed and especially since there are no figures or tables, the paper could be shortened to maybe 7-8 pages.
2. Title & abstract
 - a. I do like the title and it does reflect what the paper is about. The abstract does the same, I like how it starts with the Carl Sagan quote.
3. Contribution to science
 - a. I think the topic is interesting, but I do not think it is a major contribution to science. It does provide many new ways of thinking about the search for ET life,

but because at many points the author writes things that take away from the integrity of the paper, it is tough to have a high level of confidence.

4. Level of English
 - a. The level of English is quite good. I understood what the author was trying to say at every point in the paper, and it was written very eloquently. But, it was also very colloquial and I am not sure that is the right style for a research paper, even if it is philosophy based.
5. Literature
 - a. For the most part there is literature, but there are a few points as I have mentioned in the justification above where there should be more literature. It is important for the author to not leave any open-ended claims that are not backed up, which are done a few times throughout.
6. Presentation of results
 - a. The results are not typical in the sense that there are no numbers. But for a philosophy essay, I think that the arguments and reasoning are clearly laid out.
7. Topic appropriateness
 - a. The topic is appropriate for the journal.

Data Management

I would not say the results are necessarily reusable, but I think the essay provided new perspectives to think about this issue with which can be used by individuals in the future who might also contemplate this topic.

Additional Comments

This is a very interesting topic, and it definitely required a lot of thought from numerous perspectives in order to write such a comprehensive essay. Congratulations to the author for being able to pull off such an impressive feat in a short amount of time.