



Stephen Hawking's Warning on Contacting Aliens: A Physics Perspective on the Intelligence Trap

Seyed Mohammad Javad Mortazavi (PhD)^{1*}, Joseph John Bevelacqua (PhD)², Seyed Alireza Mortazavi (MD)³, Payman Rafiepour (PhD)⁴, James S Welsh (MD, PhD)^{5,6*}

ABSTRACT

The search for extraterrestrial intelligence is a fascinating and important endeavor, but it raises significant ethical and safety concerns. In the search for extraterrestrial intelligence, scientists use knowledge of physics to identify potential communication methods and signals that may be used by extraterrestrial civilizations. One of the most notable scientists to highlight these concerns was the late physicist Stephen Hawking, who cautioned that actively attempting to communicate with extraterrestrial civilizations could harm humanity. While it is true that we cannot predict the intentions of any potential extraterrestrial civilizations, some scientists argue that the potential advantages of seeking contact outweigh the potential risks. Deciding to initiate contact with extraterrestrial civilizations is a complex issue that requires balancing scientific curiosity with concerns for our own safety. The “Intelligence Trap” is a concept in psychology that suggests that highly intelligent people are more susceptible to cognitive biases and flawed thinking than less intelligent people. It can be argued that Hawking’s warnings may be an example of the so-called intelligence trap, as some evidence from the field of physics suggests. Nonetheless, Hawking emphasized that it is crucial for scientists and policymakers to carefully weigh the potential risks and benefits of such efforts and proceed with caution.

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Keywords

Intelligence Trap; Stephen Hawking; Space; Solar System; Planets; Exobiology; Aliens; Fermi's Paradox

Introduction

In a recent report titled “Top astrobiologist explores the possibilities of alien life. It’s time to expect the unexpected,” published in *New Scientist* by Graeme Green on 14 August 2024, the viewpoints of Nathalie Cabrol, one of the world’s top astrobiologists and author of an authoritative book on the hunt for life’s origins and extraterrestrial life, are discussed [1]. Cabrol emphasizes the importance of expecting the unexpected in the search for extraterrestrial life. In her book, she explores the possibilities of alien life and the origins of life, advocating for a scientific approach to the mystery of whether we are alone in the universe. While some people believe aliens have been visiting Earth for millennia and have even infiltrated the White House and 10 Downing Street, Cabrol calls for a more evidence-based exploration of these possibilities [1].

“The Intelligence Trap: Why Smart People Make Dumb Mistakes” by David Robson is a 2019 book that explores how even intelligent individuals can make mistakes and become susceptible to cognitive biases, leading to

¹Department of Medical Physics and Engineering, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran

²Bevelacqua Resources, Richland, Washington 99352, United States

³Amirolmomenin Hospital, Shiraz University of Medical Sciences, Shiraz, Iran

⁴Department of Nuclear Engineering, School of Mechanical Engineering, Shiraz University, Shiraz, Iran

⁵Department of Radiation Oncology Edward Hines Jr VA Hospital Hines, Illinois, United States

⁶Department of Radiation Oncology, Stritch School of Medicine, Loyola University, Chicago, IL, United States

*Corresponding authors: Seyed Mohammad Javad Mortazavi
Department of Medical Physics and Engineering, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran
E-mail: mortazavismj@gmail.com

James S Welsh
Department of Radiation Oncology Edward Hines Jr VA Hospital Hines, Illinois, United States
E-mail: shermanwelsh@gmail.com

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overconfidence and narrow thinking. This phenomenon is known as the “intelligence trap.” In this concept, highly intelligent people are more prone to cognitive biases and flawed thinking than less intelligent people [2].

This is because highly intelligent people tend to be more confident in their abilities and more likely to rely on intuition and past experiences to make decisions rather than considering new information or alternative perspectives. However, awareness of the Intelligence Trap can help individuals to develop strategies to overcome these biases and make more informed decisions.

Stephen Hawking was a world-renowned British theoretical physicist, cosmologist, and author who was best known for his groundbreaking work in the field of black holes and the origins of the universe, as well as for his popular science books, such as “A Brief History of Time.” He was a vocal advocate for scientific education and for raising public awareness of the importance of science in society. However, he also expressed grave concerns about humans attempting to contact technologically advanced alien civilizations by broadcasting signals into the vastness of space. Hawking supported the search for alien life through listening but warned against active attempts to make contact, citing the potential for disastrous consequences if advanced extraterrestrial civilizations possessed more sophisticated technology and weaponry than humanity.

A recent Newsweek report titled “Scientists Make Message to Send Earth’s Location to Aliens, Ignoring Stephen Hawking’s Warning” revisits Stephen Hawking’s concerns

about contacting extraterrestrial life [3]. Currently, Voyager 1 is hurtling through space at a mind-boggling speed of 38,000 mph (61,000 km/h). To put this into perspective, NASA’s Space Launch System, which is powered by 25 engines, can achieve speeds of up to 27,358 km/h or 17,000 mph. Nevertheless, even with these advanced spacecrafts, reaching Kepler-452b or some of the closer exoplanets within circumstellar habitable zones would take millions of years or tens of thousands of years, respectively. It is quite possible that intelligent extraterrestrial life, if it exists, possesses far more advanced travel technologies than our current propulsion systems (as demonstrated in Figure 1) and has surpassed our present level of civilization.

The late Stephen Hawking believed that direct contact with advanced alien civilizations would inevitably lead to the colonization of Earth by aliens. However, while he was undoubtedly a brilliant mind, his predictions of the unfortunate outcome of contact with extraterrestrial life may not necessarily hold true. It is crucial to consider important questions such as whether aliens share goals similar to ours, whether they have resource and territorial expansion motivations, and what their intentions might be. Therefore, we must approach the search for intelligent extraterrestrial life with a balance of scientific curiosity and caution.

Hawking expressed grave concerns on multiple occasions about humans attempting to contact technologically advanced alien civilizations by broadcasting signals into the vastness of space. While he supported the search for

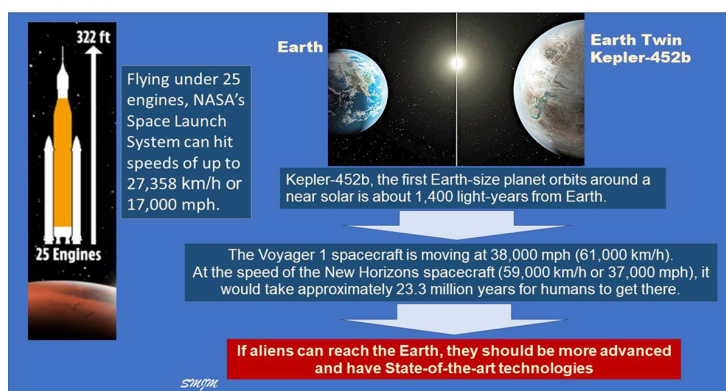


Figure 1: If aliens can reach the Earth, they must be far more advanced and have unimaginable and presently unattainable technologies

alien life through listening, he warned against active attempts to make contact, citing humanity's own history as evidence that advanced aliens may not be benevolent. He believed that the potential for advanced extraterrestrial civilizations to possess more sophisticated technology and weaponry than humanity could lead to disastrous consequences. Hollywood films, such as Independence Day, often sensationalize the drama associated with encounters with such powerful extraterrestrial beings.

There is a possibility that Stephen Hawking's notion of avoiding contact with extraterrestrial intelligence could be an "Intelligence Trap," as pointed out by Robson. While the Drake equation can estimate the existence of technologically advanced civilizations in our galaxy and beyond, we should also consider the uniqueness of Earth's path to developing *Homo sapiens*. The Milky Way galaxy alone contains at least 100 billion planets, as suggested by data from Kepler and other sources (Figure 2). However, some argue that the likelihood of reproducing Earth's specific conditions is low. For example, our planet possesses a rare oxygen-rich atmosphere produced by oxygenic photosynthesis, in addition to a global "thermostat" driven by plate tectonics and the carbonate-silicate cycle. Moreover, our Earth-Moon system is atypical, with our relatively large moon stabilizing Earth's axial tilt and reducing the probability of significant climate fluctuations that could make it difficult to maintain long-term mid-latitude

settlements if glaciation were a constant threat. In many ways, the Earth-Moon system can be seen as a binary planetary system.

Our planet's geomagnetic field acts as a protective shield from primary cosmic rays, while the atmosphere generates secondary cosmic rays through spallation events when primary cosmic rays collide with atmospheric nuclei. In deep space, primary cosmic rays can convert inorganic materials to organic materials, such as amino acids, which are the basic building blocks of biochemistry. Some scientists have speculated that radiolysis-powered life, similar to *Candidatus Desulforudis audaxviator*, may be possible due to the effects of galactic cosmic rays. This bacterium was found thriving in an anoxic, hyperthermic ecosystem 2 km below the surface, powered by hydrogen generated by radiolysis of water due to the energy released by the decay of uranium, thorium, and potassium radioisotopes. Given this astonishing revelation, it appears possible that life based on radiolysis induced by cosmic rays could exist in outer space [4]. Life may exist on many planets within the Milky Way, and despite its low probability, it remains possible that intelligent aliens also exist. This is why Hawking believed that sending a message revealing Earth's location into deep space would be a tactical mistake.

Perhaps Hawking believed that, considering our current propulsion systems, any aliens capable of reaching Earth would possess technology far more advanced than our own.

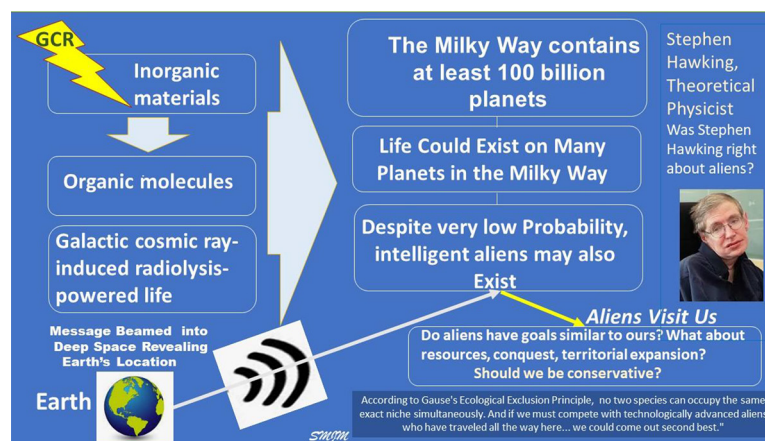


Figure 2: The Milky Way contains at least 100 billion planets. As Galactic Cosmic Radiation (GCR) can convert inorganic materials to organic materials and might allow radiolysis-powered life, life in some form or fashion could be expected on many planets in the Milky Way.

NASA has identified the exoplanet Kepler-452b and its star as the closest analog to our Earth and Sun [5]. Kepler-452b is a “super-Earth” approximately 1.6 times the diameter of Earth, located roughly 1,400 light-years from the Solar System in the constellation Cygnus [6]. Crucially, this exoplanet orbits within the habitable zone, the region around a star where liquid water can possibly exist on a planet’s surface, around a G2-type star similar to our Sun. Another Earth-like exoplanet, Kepler-186f, was discovered early in the Kepler Mission, but it orbits a type M red dwarf star. Since these initial discoveries, the list of potential Earth-like planets (with diameters less than 2.5 times that of Earth and masses less than 10 times that of Earth) in their respective circumstellar habitable zones has grown to nearly 60. As a result, the chances of the existence of intelligent, technologically advanced, civilized life within our galaxy may be higher than previously estimated.

Stephen Hawking may have been influenced by the competitive exclusion principle (also known as Gause’s law), which states that no two species can coexist in the exact same ecological niche in a given environment with limited resources at the same time. This principle has been consistently observed in experimental circumstances with microbes (such as *Paramecium sp*) in the lab, and it is the basis for Darwin’s theory of natural selection.

While the concept of competitive exclusion may seem pessimistic for humanity in the event of competitive aliens arriving on Earth, it is not inevitable. Mathematical and theoretical models (such as Lotka–Volterra models of competition) predict competitive exclusion, but it is not universally observed in natural ecosystems. Plankton, for example, violate Gause’s law by having a wide variety of species living on a limited number of life resources, mainly solar energy and minerals dissolved in the water. This is known as the “paradox of the plankton”.

Conclusion

In summary, the search for extraterrestrial intelligence is a fascinating and important scientific quest that raises significant ethical and safety concerns. While some scientists argue that

the potential benefits of seeking contact outweigh the risks, others caution that actively attempting to communicate with extraterrestrial civilizations could harm humanity. It is crucial for scientists and policymakers to carefully weigh the potential risks and benefits of such efforts and proceed with caution. The decision to initiate contact with extraterrestrial civilizations is a complex issue that requires balancing scientific curiosity with concerns for our own safety. According to some evidence from the field of physics, Hawking’s cautions could be considered an instance of the intelligence trap.

Authors’ Contribution

SMJ. Mortazavi, JJ. Bevelacqua and JS Welsh conceived the idea. They also supervised the study. SAR. Mortazavi and P. Rafiepour drafted the manuscript. All the authors read, modified, and approved the final version of the manuscript.

Conflict of Interest

SMJ. Mortazavi and JS. Welsh, as the Editorial Board Members, were not involved in the peer-review and decision-making processes for this manuscript.

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