Maybe we don't see aliens because they're waiting to hear a signal from us first

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Illustration of some of the planets in our solar system. Credit: NASA/JPL-Caltech/Lizbeth B. De La Torre

We've had a long-running series here at UT on potential solutions Fermi paradox—why aren't we able to detect any alien life out there in the Universe? But more possible solutions are being developed all the time.

Now, another paper adds some additional theory to one of the more popular solutions—that aliens are just too busy to care about us.

The paper, released on *arXiv*, was written by Amri Wandel of the Racah Institute of Physics at the Hebrew University of Jerusalem. It makes two basic assumptions. First, aliens don't really care about planets with life on them. Second, they would care if they could detect intelligent life on one.

For the first assumption to be valid, it would help if the occurrence of "biotic" (i.e., having biology) planets is widespread. In that case, even advanced civilizations might not have enough resources to devote to fully exploring those planets, especially in the form of an actual probe. And sending messages, which is much less energy intensive than sending a physical object, is pretty pointless if all those radio waves just wash over some form of a primitive single-cell organism.

Scientists have recently put more stock in this theory, given the preponderance of exoplanets found in the habitable zones of their stars. Suppose each of those develops life at some point in their evolution. In that case, the galaxy might be so teeming with it that it wouldn't be worth the time of advanced civilizations to check in on every biotic planet before it develops intelligence.

However, once a planet has developed intelligence, it might actually be interesting to them. The basis of the Fermi paradox is that it's not particularly easy to detect intelligent life. Therefore it is probably relatively rare in the galaxy so far. So any instance of it might be interesting to even an advanced civilization. To detect intelligent life from afar, the easiest thing for an advanced civilization to do would be to look for signs of artificial radio or other signals, similar to what we do with the Search for Extraterrestrial Intelligence (SETI) project.

What would that look like if the situation was reversed, and aliens could potentially detect signs of intelligence on Earth? The most obvious answer would be the radio signals that Earth started sending out around 100 years ago. In those 100 years, the signals would have theoretically reached the nearest 15,000 stars, but only those within 50 light-years would have been able to send anything back that we would have seen.

That radius includes 1,300 star systems in total, out of the 100 billion to 400 billion star systems in the Milky Way. Not much by galactic standards, but still a non-zero number. However, SETI scientists think that the radio signals we sent out, which were more of an accident of broadcast television rather than any intentional signaling mechanism, would be indistinguishable from background noise after about a light year of travel.

Therefore, even in those 1,300 star systems that could have responded, there is a pretty good chance that they wouldn't even have been able to detect our unintentional technosignature and might still be ignorant of the intelligent life on this planet. And if non-intelligent life is abundant, why would they bother spending any resources to attempt to contact a potentially non-intelligent world? Hence, a solution to the Fermi paradox—aliens have been silent so far because they haven't seen any indication that we are intelligent.

It is certainly an elegant solution and one that has been posited in other forms previously. However, the argument is well explained in Wandel's paper, which is worth a read to anyone interested in solutions to potentially the greatest question of our time.

More information: Amri Wandel, The Fermi Paradox revisited: Technosignatures and the Contact Era, *arXiv* (2022). DOI: 10.48550/arxiv.2211.16505

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