

If the Universe is Teeming With Aliens...

Where Is Everybody?

Fifty Solutions to the Fermi Paradox and the Problem of Extraterrestrial Life

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Enrico Fermi was a Nobel laureate in Physics who worked at Los Alamos during the development of the atomic bomb. He died at age 53 which, being the age I am now, made me stop and calculate that his age then had been my age in April of this year.

One day at Los Alamos, the gang of Nobel Laureates were having lunch (which, in many ways reminds me of my Friday lunch group at JPL except for the “laureates” part) when Fermi wondered, out of the blue (or out of the black perhaps) “Where is Everybody?” This question is the statement of the Fermi Paradox.

In the 20th century homo sapiens have reached great heights of technology. We have built radio telescopes that “listen” or “see” far into the universe, beyond our own galaxy. As often happens with people so focussed on what they can do right now and the way that they think right now, we wonder why we don’t hear other intelligent beings using the airwaves when we listen on these great telescopes. We do, after all, hear each other.

Many have made their careers on this question, including Jill Tartar, putative model for the heroine in Sagan’s movie *Contact*. Paul Allen, Microsoft’s Number Two, has put money into the Allen Array in an attempt to answer this question. Of course, Sagan himself formed the Planetary Society largely as a public SETI (Search for Extra Terrestrial Intelligence) promotion effort. The consensus around NASA, where I work, is that there is life all over the place (this is Sagan’s influence) and that we will discover it imminently, probably within our own careers. Just a little swampy, methane producing bacteria on Mars or Europa would be enough to extrapolate all of Star Trek and Star Wars onto billions of our neighboring stars and galaxies

Or maybe the universe, apart from earth, is in fact sterile....

But the thing is, the universe is huge and it has been here for a very very very very long time (at least per our perceptions) and it seems incredible that we would be alone in it. On the other hand, it would indeed be the news of the (brand new) millennium if our neighbors were found. So, due to the way we now see the universe and some of the magic (i.e. radio) of it that we understand and manipulate, it is a reasonable question for the brilliant of the 20th century to ask. So, where is everybody? Surely.....

Webb spends something from a few paragraphs to several pages going into some detail about each of fifty possible answers to this question. Here is my paraphrase of his titles with a little of my own commentary.

First, the category of “They are here but we don’t see them.”

1. They are here, they are Hungarian. Fermi and his Nobel cohorts were Hungarian.
2. They are here and they are involved in human affairs.
3. They were here and left evidence. Von Daniken.
4. We are the aliens!
5. We are in a zoo and don’t know it.
6. We are in a zoo protected by the Prime Directive.
7. What we see “out there” is really a planetarium devised for us.
8. God Exists. (We are unique, just like the Bible, or your favorite sacred text, says.)

Next, the category of “They exist but have not yet communicated.”

9. The stars are too far away. Interstellar travel is slow or impossible.
10. They haven’t had time to get here.
11. They haven’t had time to percolate to here.
12. Maybe they are doing von Neumann machines instead.
13. G2 stars (like ours) haven’t been stable long enough.
14. They stay at home. Like dolphins.
15. They stay at home and surf the net. Does our own civilization reach out?
16. They are trying to signal us but we’re not listening yet. Like radio in 1800.
17. We don’t know where to listen.
18. Our strategy is wrong. Like using telescopes instead of radio in 1800.
19. We have the signal, we just need enough post-docs to get it out of existing data.
20. We haven’t listened long enough. A hundred years of technology is nothing.
21. Everyone is listening; no one is talking. This happens on ten meters all the time.
22. Berserkers. Every sufficiently advanced civilization destroys itself pretty quickly.
23. They don’t want to talk to us. We are like ants. Do you talk to ants or care to?
24. They have different mathematics. Interesting....
25. We don’t recognize the signal.
26. The universe is stranger than we imagine. We anthropomorphize, nature may not.
27. Astrophysical catastrophes.
28. They reached the Singularity (and don’t care anymore). Some think we will soon too.
(They are all wrong.)
29. Cloudy skies. A variant on being on the wrong frequency.
30. Not within our particle horizon. A variant on too far away.

And the final category is “They aren’t there.”

31. The universe is here for us. Similar to “God exists,” but Webb doesn’t cast it that way.
32. Life can have emerged only recently. A variant on “not enough time yet.”
33. Planetary systems are rare. The Kepler mission is working on this right now.
34. We are the first. That would be about as remarkable as “We are the only.” (But somebody has to be first.....)
35. Rocky planets are rare. Could be. We’re just now really able to look for this.
36. Continuously habitable zones are narrow. A variant on anthropomorphism.
37. Jupiters are rare. Some think that Jupiter-driven astrodynamical stability is key to our being able to be here.
38. Earth has an optimal evolution pump. Huh?
39. The galaxy is a dangerous place. Decidedly.
40. A planetary system is a dangerous place. Decidedly.
41. Earth’s system of plate tectonics is unique (and is involved in the evolutionary pump).
42. The moon is unique. (One of my favorites.)
43. Life’s genesis is rare. Near “miraculous.” God?...
44. The prokaryote-eukaryote transition is rare. Perhaps even unique?
45. Toolmaking (or language bearing) species are rare. Or unique.
46. Technological progress is not inevitable. Consider again the dolphins, the elephants, the whales.
47. Intelligence at the human level is rare. (Or one might say, “bizarre.”)
48. Language is unique to humans. Or rare.
49. Science is not inevitable. Platonic science held us up for a few millennia, for example.

And, who knows that the science we have now is anything close to right. It’s just falsifiable interpretations of what we can readily sense.

Finally, he gives his own answer and his own proof. Webb believes (surprisingly) that we are alone and that the main proof is the profound silence. He thinks that there may be lower order life forms elsewhere but that none of them have made all of the seemingly improbable jumps given in the various reasons, to reach our status and start making “I Love Lucy” shows for us to detect, much less directed communications. Does this then mean we are first? Will practical interstellar travel or communication ever emerge? These questions are then unanswered even if Webb is correct about Fermi’s.

I have two problems with this but admit that neither is really more than just my own difference of opinion. First, it violates “mediocrity,” that is, what we experience is highly likely to be “normal,” and not extraordinary. On the other hand, if we *are* the only inhabitants of the universe, that would just be the way it is. How could we know any different?

Second, I don’t so readily buy the vast silence. Many of the reasons discussed dealt with this, not directly including conspiracy, the idea that “the government” knows all about all such things and has it all locked up at Area 51. I don’t believe in Area 51 or that there is anything extra-terrestrial there, but, well, I’m not always right about everything.

After presenting the various bits of evidence in each case, Webb would typically weigh in on them in ways that I rarely found agreeable to my own biases. Something that he would consider unlikely, I wouldn't. Something that he would consider probable, I might not. So, it is no surprise when he gets to his own conclusion and I have problems with it.

On the other hand, Webb seems more even-handed with Occam's Razor than some. King Occam was opposed to anything being more complicated than necessary and this "principle" is often used in science, as by Einstein in struggling with unification theories. It's a nice principle for finite and limited humans who are trying to understand things to use, but I don't know why anything in nature *requires* it.

It would be nice, all the same, to discover, as Freeman Dyson has suggested, "freeze dried seaweed orbiting Jupiter," presumably blown up from an impact with Europa. That would be a possible version of the "news of the millennium."

Webb seems to use "galaxy" and "universe" interchangeably but they are far from being so. Outside of the galaxy the "far away" problems get immensely worse, so it doesn't help much to discuss the whole universe in any case.

I think I bought this book thinking it would be dealing with Olber's Paradox, that is, "If the universe is infinite, why is it dark at night?" Any line of sight should eventually hit a star. But I guess Einstein dealt with that. The universe is not infinite, and anyway, there is dust between here and just about anyplace else. So I guess that wouldn't be as much of a book.

Isn't it just as remarkable that the universe is *finite*, however?

As I've alluded already, I think Fermi's question and it's many answers says more about who we are and what we think right now given what we know and, more importantly don't know, than it does about the question itself. I can imagine future discoveries that would cause the whole debate to suddenly become nonsensical. If I'd told you in 1850 that I could build an apparatus that could communicate to another similar apparatus on the other side of the world nearly instantly, you'd have thought it was both unrealistically fantastic and un-needed, given the thinking and conventions of that day. If you did believe me and had any imagination, you'd be frightened by the possibilities. Yet, in 2009, this capability is commonplace, things are scary, and Fermi's question is enabled.

Bring me this book in 2268 and we'll talk again.