Fermi's Paradox and The Search for Intelligent Extraterrestrial Life

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While not entirely erroneous thinking, I observe a good bit of what I would term "wrong-heading thinking" regarding the possibility of, and the search for, intelligent extraterrestrial life.

The conventional scientific/logical perspective is dominated by the notion that our Universe is teeming with intelligent civilizations. With lots and lots of planets out there in every galaxy … and lots of lots galaxies out there … why there just has to be lots and lots of intelligent extraterrestrial civilizations out there, right? Or so the thinking goes.

This thinking has been bolstered by both logical argument and raw emotional appeal. Carl Sagan was a leading emotional proponent, constantly tugging at the heartstrings of his audiences regarding the "billions and billions" of planets in our Galaxy, the commonality of the molecules of life and such. Sagan argued for a number as high as 1 million intelligent civilizations in the Milky Way Galaxy alone. Even Stephen Hawking succumbs to this appeal when he states "To my mathematical brain, the mere numbers make thinking about aliens perfectly rational." As logical argument, the Drake equation is a probabilistic approach that claims to calculate the number of planets with detectable life, including a variable for all of (what he deemed) the relevant factors for the existence of such a civilization. Several of the variables require highly speculative valuations, so the final solutions vary significantly. However Drake himself spoke of between 1,000 and 100,000,000 civilizations in our Galaxy. And so SETI continues its hopeful search for at least one of them.

All these arguments simply ignore the point that, if all these gazillions of intelligent extraterrestrial civilizations actually exist, we would have easily discovered something, *anything*, that proves at least one of them is so. But, of course, we have not. In fact ***that*** argument, known as Fermi's Paradox, is the only argument that scientifically agrees with the mass of (absence of) data and evidence … that scientists claim to treasure as part of the Scientific Method. How ironic that Sagan himself once famously stated that "extraordinary claims require extraordinary evidence." That is, unless, it is Sagan himself who wishes to claim The Universe is teeming with intelligent civilizations. Then the evidence be damned.

The probabilistic method of Drake is fundamentally flawed, in that the calculation typically includes numbers greater than one. Probabilities fall between zero and one, inclusive, but not *greater* than one. Zero means no chance, one means certainty. Yet we see larger numbers being applied to calculations in Drake's equation.

More importantly, a basic cumulative probability is properly calculated by *multiplying* all the individual probabilities. Example: Since the odds of a child being born a girl are basically 50%, then the chances of your next *two* children *both* being born a girl is 25%. The calculation is 0.50 x 0.50 = 0.25. That's why large families with all girls (or all boys, for that matter) are more rare.

Hence each time we add in an additional factor that a extraterrestrial intelligent civilization requires, the associated probability ***lowers*** the odds that a civilization will exist; if we add a third girl into the example scenario, then the odds are 12.5%, a fourth girl, 6.25%. Mathematically, you won't get a

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meaningful probability … if you start plugging in values greater than one. Said that way, it only makes sense.

Let us forget for a moment what it takes for such a civilization to *emerge*, but just consider what it takes for such a civilization to *survive*. What is the probability that an intelligent civilization has been recently destroyed by an asteroid? I don't really know. But I DO know, whatever the probability, it *lessens* the chances of their current existence. What is the probability that the civilization blew itself up in a nuclear war? Now the likelihood of such a civilization is even lower still. Or the planet being swallowed up by a supernova? Or the civilization not ever discovering antibiotics prior to a plague? Or it being zapped by a coronal mass ejection? Or decimated by an ice age caused by random temperature fluctuation? Or made extinct by a gamma-ray burst? Or by a random carbon dioxide imbalance dissolving the ozone layer? Experimentation with biological weapons gone wrong? Over-consumption of food sources leading to mass starvation? Raging thunderstorms rising to blot out the light of the planet's star? Or a sun that cools the least bit leaving the planet outside its habitable zone? Or potable water being poisoned by some odd occurrence of nature?

There are a nearly infinite set of conditions required to create and maintain an intelligent civilization, and unless you have them all in place, then there's no such civilization. That means that intelligent civilizations, emerging and then existing for any length of time, **are actually extremely rare**. Not bursting out at the seams as Sagan and Drake would have us think. Other intelligent civilizations, when they do occur on this rare occasion, usually don't last very long, when/as they lose some condition of survival. We forget that our *own* civilization, in terms of the vast age of our Universe, is but the briefest flash-in-the-pan. In such a brief existence, we shouldn't be the least surprised that another civilization, so rare, perhaps on the other side of our Galaxy, hasn't found us … or us them. This is the rarity that agrees perfectly with observation, as "called out" by Fermi's Paradox. A book that supports this line of thinking, *Rare Earth—Why Complex Life is Uncommon in The Universe*, continues to be overlooked by the scientific community, in favor of the dominant wishful thinking of the likes of SETI, Sagan & Drake.

I personally prefer to imagine these intelligent civilizations as each just a brief twinkle somewhere in the Milky Way, here and there, throughout our Galaxy, no more than one or two at a time perhaps, separated by vast distances and directions, twinkle here then twinkle gone, never having had much chance to discover one another … or to develop any technology that would allow them to do so.

When I read of the excitement from the discovery of a nearby exoplanet (such as Ross 128b) in the hope it holds life … or even intelligent life, I am baffled. There is effectively zero possibility that such a planet that happens to be so very close, also happens to have intelligent civilization … and at the very same time as us, at this very instant within the extensive history of our Universe … even though most such civilizations just don't last very long at all.

When one reads all this wrong-heading thinking it certainly seems to well evidence the described structure of scientific discovery for which Karl Popper argued, that as a theoretical paradigm begins to strain under contrary (or lack of) evidence, it comes under more influence from irrational theoretical patchwork intended to preserve its forward trajectory, until a sharp point of breakthrough—a paradigm shift—occurs, forcing abandonment of the old paradigm in favor of a new, more apparent and more explanatory paradigm.

Given the argument above, now we *think* we see some resolution of Fermi's Paradox (again, if all these gazillions of civilizations actually exist, we would have easily discovered something, *anything*,

that proves at least one of them is so), that being that these gazillions of civilizations actually DON'T exist. But it is not entirely that simple, there is still more to consider.

There are two types of evidence in play here, unintentional and intentional. Consider the film *Contact*, that speaks to this subject. In the film, intelligent extraterrestrial life has discovered evidence of our existence, our broadcasts of radio and television waves. That evidence *they discovered* was *unintentional* on our part, merely a byproduct of our civilization. In response, that intelligent extraterrestrial life broadcasts to Earth a loud radio pulse that contains diagrams for constructing a space travel device. That evidence *they sent* was *intentional* on their part, a message intended for Earth. When we search for evidence, as does SETI, we search for both, unconsciously making no distinction between the two.

Let us first consider more closely the case of *unintentional* evidence. Even though other civilizations are rare and likely too distant at this particular given moment, the argument above still suggests that, over the entire history of the Universe, there have been some enumeration of intelligent civilizations, twinkling on and twinkling off. Taken in total, then, there should still be a lot of radio waves and other unintentional evidence drifting about our Universe. And even though that evidence would take a long time to arrive, in many cases long after many of those civilizations are extinct, in total, the Universe ought be to some extent awash in it, so there ought to be a dribble of it for us to discover. But we haven't discovered any dribble of it. So we are back to Fermi's Paradox once again.

The answer to this paradox is not entirely encapsulated within the fact that there are far fewer civilizations that Drake and Sagan imagine. For, indeed, there have surely been (at least) some. Rather the answer lies on the flip-side of the coin, in it must be that there is no such unintentional evidence that is discoverable by us. And there is good reason to think that that is so. Radio and television waves, as a byproduct of our own civilization, are an extremely short-lived phenomenon. In less than one hundred years, we have discovered their use, and now already nearly abandoned them. My home radios are Internet radios. My television signals are delivered by cable and Internet. This is the reason we do not see unintentional evidence: that the sources of such evidence, as we imagine them, are only most briefly employed by intelligent extraterrestrial civilizations. When factoring in that acknowledgement, along with the rarity of such civilizations and the vast distances involved, now we see why our Universe is not awash in such unintentional evidence. Which is why we do not detect it. When we look for it, we waste our time, intellect and resources.

Now let us consider the case of *intentional* evidence. We hope that those extraterrestrial civilizations are broadcasting something or other, some kind of message or signal, with the hope they make contact with other civilizations. But think about it, how would they do so and where would they send it? They already know what we know, what is argued above, that waves of light or radio broadcast 'shotgunned' into The Void cannot hope to cover the distances required in time to reach other civilizations *en masse*, in time for other civilizations, perhaps any other civilization, to survive long enough to even discover them. There would be no point to originating intentional evidence, not at least in that way. So it is not, and so it is not there. So, again, when we look for it in that way, we waste our time, intellect and resources. And those other civilizations are intelligent enough to know that they would be wasting their time, intellect and resources. So they don't bother. On the other hand, we *hav*e bothered with such "active" methods on a few occasions: the Arecibo broadcasts, placing messages on the Pioneer & Voyager probes and such. But the chance of contact from such methods is effectively zero … and, intuitively at least, we know it. Which is why, perhaps unconsciously, we don't do much of it either. *We* are intelligent enough to know that *we* would be wasting *our* time, intellect and resources.

That is not to say that other civilizations do not reach out at all. They may well originate intentional evidence, but almost certainly not in the way we imagine we should look for it, or how. Not in a way in which our current technology or knowledge is capable. It is likely those civilizations that do reach out are more advanced than our own civilization, having discovered far more effective ways to reach out, ways we cannot yet imagine, ways which we do not yet know how to observe. This is also why we see no intentional evidence. Again, we don't know what to look for, or how to look for it.

It is all so reminiscent of an old parable (or poor joke, if you will). A drunkard has just left a pub and is staggering about in front of it, in pitch dark. Suddenly he realizes he has dropped his wallet. So he rushes down to the corner of the street where there is a lamppost. He begins searching about for the wallet. An observer asks the drunkard what he is doing, the wallet is down the street, not here, why is he looking here instead. The drunkard replies "But sir the light is much better here." This is how we have been conducting our search for intelligent extraterrestrial life. Not where and how it might actually be found, where the search would be deep in our intellectual and technological "darkness," but instead "down at the street corner," where we have all our tools of radio telescopes and such, where our intellectual and technological light is much better.

As aside, know that we have to accept the distinct possibility that such civilizations indeed do NOT reach out to civilizations such as ours at all. Consider for a moment our own relationship with ants and bees. To measure against our own intelligence, we would not say ants or bees are intelligent. At first blush. But think again. They live together in complex 'cities' they themselves design and construct. They establish territory and defend it; in fact individuals rapidly self-organize to defend their home and children when threatened by aggressors or predators. Individuals are adept at recognizing useful information and actively communicate that information with other individuals toward work goals and common good (e.g., ant pheromones or bee dancing). They self-organize into specialized and individualized tasks across large numbers of workers capturing the efficiencies of mass production. They farm or manufacture their own food (a certain species of ant cultivates fungus deep within its nest). They live within a complex and hierarchical social structure that is founded then guided by the actions of elite leadership. They are societally organized, cooperative, communicative and generally non-aggressive toward one another. Not as intelligent as us, but not exact dumb rocks or sprouting weeds, either. Bee and ant colonies possess a rudimentary form of intelligent civilization, rudimentary when compared to us, but possessive of purposeful intellect nonetheless. Given that, when has our own more intelligent civilization ever once 'reached out' to communicate with ants or bees, on their own terms, to bring them into the family of intelligent civilizations? Have we ever messaged our intelligent civilization and language to them, ever said "hello we are out here" using ant pheromones or bee dancing? Never once, of course. Though we have the technology and intelligence to do so, if we want. They are ants & bees … and we are far more intelligent human beings, not the same thing, that is the way we see it. No doubt extraterrestrial civilizations of more advanced intelligence and technology might well see us in the same way. See us of such crude intelligence that any effort would be pointless and of no interest. Yet even more reason why we do not detect any evidence, just as Fermi's Paradox observes.

However, assuming such a civilization ***does*** reach out by some effective methods, let us see if we can even begin to imagine what those methods might be.

Once, long ago, I was taught of a concept that was referred to by that instructor, as "modicum of consensus." Suppose a man and a woman meet on an airplane bound for New York City and become quite enamored of one another. They exchange only first names, but are adamant they want

to meet the next day in Manhattan and explore the city (and each other's company). But they become separated at the airport, before exchanging any further information about one another nor any information about where they might want to go explore. Let us suppose the airline is not willing to share the name of one with the other. And that the two have not shared any other information that would facilitate being able to find one another again readily. What to do? I was also taught that a research study found a surprisingly common answer among people posed with this dilemma. Go wait tomorrow at noon at the clock at Grand Central Terminal. Once said, it seems fairly logical. It is a well known and central location, and a central time of day. While the two cannot communicate they know that, to find one another, the meeting must take place at a point of consensus, a place & time that possesses a certain commonality among all people, a place & time that is distinguishable and unique, apart from the myriad of all the other possible places they might choose to try to meet. And this is something both of them knows the other knows. So each can hope the other will realize it is a logical choice. I suppose sunset atop The Empire State Building or the middle of Times Square at midnight might also qualify. But the list of such places & times is reasonably short, and so both should know that this is the list from which the other should and would pick.

So when it comes to originating such evidence, reaching out, why would another truly intelligent and advanced extraterrestrial civilization fire it out into our Universe willy-nilly shotgun and hope for the best? (As we have done with Arecibo and Pioneer and Voyager.) Why not choose a point that bears some modicum of consensus? And where are there such points in our Universe? The center of a galaxy, perhaps (or as close as possible to it). Or perhaps near the horizon of a massive black hole. Or perhaps the center of a large nebula/supernova. Perhaps the location we perceive as our Universe's center, from which all galactic motion appears to emanate. Or perhaps FRB (Fast Radio Burst) 121102, thought to be a neutron star, a source bursting repeated and unequalled power, observable for at least several billion light-years in every direction, across a nearly infinite number of galaxies. Not to suggest that the bursts of FRB 121102 are themselves a reaching out of intelligence, but rather to suggest their prominence and uniqueness in our Universe might mark them to serve well as a location to be thought of as our Universe's "Grand Central clock." A place of intellectual consensus, where both would understand to meet, a place for one to leave messages or evidence for others to find, a place from which another intelligent extraterrestrial civilization might choose to beacon and beckon (in some way we do not comprehend) just because they know others ought be wise enough to look there *for* a beacon that beckons.

So there is but one possible line of thought regarding "where." Now what of "how?"

Of course we speak here of technology and intelligence beyond ourselves, so by very definition we do not know the answer to the question of "how." It seems likely that whatever the answer might be, it violates what we believe to be the constraint of light-speed. Given the vast distances involved and the brevity of most of these civilizations, waves moving at the speed of light are just not going to be effective in making a contact/connection. So it will have to be something faster to be effective. I don't know, of course, how to breach what we believe to be the universal constant of light-speed, nor whether it can even be done. I do know that a sufficiently advanced intelligent civilization won't invest any serious effort to contact/connect unless it knows how to do so. We don't know how to do so, of course, so we cannot effectively reach out … and it may well be that our lack of knowledge prevents us from detecting evidence emanating via such technology. Yet even *more* reason why we do not detect any evidence, just as Fermi's Paradox observes.

This is just one possible line of thought regarding "where" and "how." It may be correct, it may well not. There are likely a myriad of other lines of thought, most of which we have not begun to

imagine or discuss. The point of the above posited thoughts regarding "where" and "how" is that we *need* to imagine … and discuss … and discover … because what we now know, and what we now think, is wholly inadequate toward the task at hand.

To synthesize these arguments:

- Intelligent extraterrestrial civilizations have certainly existed, and do now likely exist. But that existence is actually a quite rare event, given the many, many conditions required for them to emerge. That rarity, being almost certainly separated by vast distances and directions, means that contact or communication is highly inhibited and unlikely.

- Most intelligent extraterrestrial civilizations will only exist & survive for only the shortest periods of time, again given the many, many conditions required for it to do so. Accordingly, another intelligent extraterrestrial civilization besides our own, existing at this very same moment in the history of our Universe, is even much more rare.

- Any distribution of unintentional evidence of intelligent civilizations by technologies we currently comprehend, such as radio waves, is highly unlikely to exist at all, as those civilizations likely only employed such technologies for an extremely brief period of time, after which they were abandoned for other, more advanced technologies, technologies beyond our own comprehension.

- Intelligent civilizations, including our own, are unlikely to even bother to broadcast intentional evidence of existence by any technologies we currently comprehend, as they (and we) are well aware those technologies are going to be essentially ineffective in establishing contact/communication in any reasonable amount of time across the vast distances and directions involved.

- If intelligent extraterrestrial civilizations are actually emanating unintentional or intentional evidence of their existence, it is almost certainly through the use of more effective technologies and strategies that we do not yet comprehend. That being why we do not detect it.

- Intelligent extraterrestrial civilizations significantly more advanced than our own might well have no interest whatsoever in originating intentional evidence toward, and/or establishing contact with, an intelligent civilization no more advanced than our own.

- The ***lack*** of any evidence of other intelligent extraterrestrial civilizations support these above arguments … and resolve Fermi's Paradox … while also clearly falsifying the current wishful thinking that our Universe is brimming with intelligent extraterrestrial civilizations, just because "it is so big there just has to be lots of them out there."

Instead of wasting mankind's time, intellect and resources searching for evidence of intelligent extraterrestrial life … that will never be found with our current knowledge and technologies … we should invest our time, intellect and resources toward trying to divine, discover and develop whatever hereto unknown knowledge, technologies and strategies that exist … that *will* allow us to discover and/or deliver such evidence.