

SETI and the problems with searching for alien life.

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E.T. is out there. Why can't we find him?

Photograph by Digital Vision.

This is the first half of a two-part article on Earth's legacy and the search for extraterrestrial life. Read Part 2 [here](#).

In 2002, a professor at the University of Hertfordshire set out to determine the world's funniest joke. With help from the British Science Association—that bastion of comic authority—he set up a website where people could submit and vote on the entries.

The first runner-up, which only narrowly missed the laurels, was a joke about Sherlock Holmes and Watson on a camping trip. There are a few variations, but it basically goes like this:

Sherlock Holmes and Dr. Watson are going camping. They pitch their tent under the stars and go to sleep. Sometime in the middle of the night, Holmes wakes Watson up and says: “Watson, look up and tell me what you see.”

Watson replies, “I see millions and millions of stars.”

“And what do you deduce from that?” Holmes asks.

Watson replies: “Well, if there are millions of stars, and if even a few of those have planets, it's quite likely there are some planets like earth out there. And if there are a few planets like earth out there, there might also be life.”

To which Holmes responds: “Watson, you idiot, somebody stole our tent!”

Watson, ever Holmes' warm-blooded foil, has touched on the elementary reason why a handful of researchers have, for more than 50 years, been scanning the stars in hopes of picking up a signal from another civilization. More formally, you might say there are three arguments for the abundance of life in our galaxy and beyond. First, as Watson said, among the 200-some billion stars in the Milky Way alone, there must be a large number of hospitable planets. (In fact, we've already found a few dozen.) Second, nothing about our own existence suggests we are unique. And third, life forms can survive in the most treacherous of environments. If it could happen here, in other words, it could happen anywhere.

It takes a Watson to believe so much in the possibility of extraterrestrial life that he'd be willing to devote both time and money to searching it out. It's the Sherlocks who have to sign the checks, though. Earlier this year, the SETI Institute—that's “Search for Extraterrestrial Intelligence”—went dark after California slashed funding to the Allen Telescope Array that SETI uses to scan the skies for signals from other civilizations. (The SETI Institute, already in large part privately funded, was able to raise enough money to reopen in August.) It's a familiar setback. NASA spent four years preparing the equipment for a major 10-year search that began in 1992. Congress cancelled the program in 1993, prompting many of the scientists working on that project to join the SETI Institute.

With its telescopes back online, 2011 is looking like the beginning of a golden age in alien hunting. In previous decades, SETI efforts were horribly inefficient, and consisted of pointing telescopes at nearby stars and briefly listening in for any signals that might suggest the presence of an advanced species. Now that NASA's Kepler spacecraft has begun to identify planets elsewhere in the galaxy—so far it has found 1,200 of them, of which 54 look like they might have friendly conditions to support life—SETI will home in on these Earth-like bodies in a much more targeted approach. Though the White House has lately denied having any

evidence of extraterrestrial intelligence, the odds of finding an alien civilization out there are about to increase immensely.

How immensely, though, is anyone's guess, because there is one troubling problem with the search for radio emissions from other civilizations that no number of spacecraft or radio telescopes can resolve. Say, for example, that Kepler were to discover a very Earth-like planet 450 light years away—one capable of holding liquid water and all the other things that, by our present definition, are essential for life. So we tune our (privately-funded) radio telescopes at this star system. At this point, we're listening for an activity that might have been going on there in the Earth year 1561. In order to detect anything, then, the civilization that exists on this planet has to be at least 400 years ahead of ours. (Likewise, if they were to turn their telescopes on us, they wouldn't hear a thing, since no man-made signals were escaping out of the Earth's atmosphere in the 16 century.)

It's perfectly possible that our fantasy civilization would be 500 years ahead of us—but no more likely than its being 500 years behind us, or 1 billion years behind, or awaiting us 1 billion years in the future. The universe is about 13 billion years old, and Earth's arrival on the scene 4.5 billion years ago did not occur at some divine moment of planet formation. It's possible that this other, Earth-like planet was at one point dotted with thriving alien cities, that it sustained an intelligent species for millions of years, but that life there winked out at around the same time we humans were working out the kinks in having opposable thumbs. If so, our neighbor's dying signals would have passed us by millennia before we could invent the radio dishes to capture them.

Astronomers call this the “synchronicity” or “life islands” problem, and it seems defeating except for one loophole: Say that long ago, this neighboring civilization, realizing it was cooked—imminent nuclear war, a dying planet, a robot rebellion, whatever—constructed a permanent radio beacon to outlast it, one that would seed the cosmos with detectable signals long after the species that made it was gone. It could still be there now, just waiting for someone to tune in. Nothing about this is science fiction; in fact, locating an interstellar beacon is the best chance Earth has of finding a neighbor. We just have to know where to look.

The physicist Michio Kaku seems to believe that anything is eventually possible, which is why I called him to talk about intergalactic lighthouses. Kaku is a respected theoretical physicist and strong proponent of string theory, but he's also a worthy heir to Carl Sagan for his ability to popularize physics and astronomy. His book *Hyperspace: A Scientific Odyssey Through Parallel Universes, Time Warps, and the 10 Dimension* first tuned me in, during the 10 grade, to the very real weirdness of how the universe works, and a more recent book of his makes the scientific case for force fields and teleportation, among other things. Naturally, he is a big Star Trek fan.

In fact, Star Trek came up right away when we got on the subject of whether there is any reason to think an advanced civilization would ever build some form of beacon to preserve its memory after all other traces of its splendor are gone. Kaku recalled a *The Next Generation* episode called “The Inner Light,” in which a strange probe zaps Captain Picard with a beam that knocks him out and sends him into a dream existence as a weaver on a distant, unknown planet, unaware of his real identity. He lives out his simple life on that planet, which is rapidly heating and becoming inhospitable to life. His last memory, as an old man, is that of a probe being launched that contains the history of the dying civilization, which will replay its final years in the mind of whomever it encounters. (Picard, meanwhile, awakes to discover that only 25 minutes have passed.)

“That was its way of preserving its collective memory,” Kaku said. “That meant he had a tremendously intimate understanding of this civilization.”

For us humans, there's something attractive about the idea of leaving some trace of ourselves for posterity, in the same way that we're programmed to propagate our genes down the generations. Might some long-dead society of extraterrestrials have had the same impulse? One widely-cited “working definition” of life calls it “a self-sustaining chemical system capable of Darwinian evolution,” which would arguably produce the same

instincts. Of course, many in the astrobiology community find this definition woefully inadequate and see no reason to believe aliens would have the same desire to leave something behind. When I ran the idea by Paul Davies, an Arizona State University professor who once chaired the committee on how to break the news when aliens are first detected, he was doubtful that the self-propagating instinct would persist as a species became more and more technologically advanced.

“This need to preserve something for posterity—that’s something we’ve inherited from evolution,” he said. “If we’re dealing with intelligence elsewhere in the universe, it may long since have abandoned its organic roots.”

It is a maddening idea: To think that all these years we could have been pointing our radio telescopes in the exact right direction, only to be listening in on a long-dead race of aliens that never bothered to erect a grand memorial to itself, or even to scribble out some galactic graffiti for our benefit. Who knows if it’s even possible for a civilization to construct the kind of beacon that would beam out its epitaph for millions or billions of years? If our aliens had possessed the will to create such a thing, would they even have had the skill? Whether or not your evolutionary impulses are tweaked by thoughts of leaving behind a gravestone, we ought to hope that other civilizations were so moved. It’s the best chance we have with present technology of discovering anyone else in the universe. But that line of thinking has a way of turning back on itself: If another civilization was so kind as to send a few signals our way, we ought to return the favor. We ought to build our own beacon. It’s a simple matter of interstellar courtesy.

At press time, the planet Earth has about 5 billion years left before our sun becomes a red giant, probably swallowing us up in the process. There are any number of ways that our fate could be hastened. The moon could take a hit, throwing us off tilt; we could succumb to a super virus; global warming could bake our planet to a crisp; or we could nuke one another into oblivion. There is a distinct possibility that we are living out the final act of the human race. This is not some gloomy assessment of humanity. It is a basic fact of the uncaring randomness of the universe, not to mention our stunning incompetence at preserving our finely-tuned habitat. As those investment commercials say, it’s not too early to start thinking about our retirement.

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