



If Aliens Are Spying On Us, Their Space Probes Would Look Like This, Scientists Say

Scientists are hard at work considering what kinds of engineering alien probes would need to reach us through interstellar space.

BY [SARAH WELLS](#) PUBLISHED: FEB 12, 2024

When you hear the phrase “alien probes,” what comes to mind?

Maybe it’s [abduction stories](#) from the 1960s, in which alien doctors poke and prod human subjects with surgical tools. Or perhaps you picture something a little more like [Oumuamua](#): a rocky, cigar-shaped “[interstellar interloper](#)” that slingshotted around the center of our solar system roughly [15 million miles](#) from Earth back in 2017.

It’s this second type of potential “probe” that has attracted the attention of scientists, including Harvard astronomer [Avi Loeb](#). In addition to suggesting that Oumuamua [might have been an alien spaceship](#), Loeb, who holds a Ph.D. in plasma physics, has also searched the bottom of the ocean for evidence of alien visitors. These ideas, however, are [not widely accepted](#) in the greater scientific community.

But that doesn’t mean scientists aren’t actively preparing for the possibility of alien probes to arrive one day—or discovering they’ve already visited. In theory, these probes could be similar to the type of space probes that Earth scientists have already sent out into space, including missions like [Voyager](#) and [New Horizons](#). At their core, space probes (of alien *or* human origin) are scientific [instruments sent into space](#) with the goal of collecting information about space or other planets.

However, crossing deep space to reach Earth with a probe would require know-how that Earth scientists have not yet mastered. This is why scientists are hard at work considering what kinds of engineering alien probes would need to reach us through interstellar space, and how we might [intercept their communications](#) if or when they arrive.

“Earth has had biosignatures for 3 billion years,” says [Adam Frank](#), Ph.D., a professor of astrophysics at the University of Rochester who has [written books](#) on the search for extraterrestrial life. [Biosignatures](#) are things like oxygen in our atmosphere or water on our planet that could support the presence of life as we know it. Some signatures can even be detected from space using methods like [spectroscopy](#) to “read” the chemistry of a planet’s atmosphere.

“If there are [such things] as space-faring civilizations, it is not beyond possibility that somewhere in those 3 billion or 4 billion years that somebody came through, or somebody sent probes,” Frank says.

Alien Physics



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If an alien civilization wanted to send a probe to Earth to collect information about our planet, it would face two major challenges: distance and time.

For example, if alien probes were sent from our nearest galactic neighbor, the Andromeda galaxy, they would need to travel a distance of [2.5 million light years](#). With each light year being equivalent to 6 trillion miles, this would be an enormous and extremely long journey to make. To get the probe to Earth before the alien civilization crumbled to dust, its inhabitants would need to invent a way to [travel faster than the speed of light](#).

Unless aliens discover a new law of physics that we don't know about *and* find a way to take advantage of theoretical wormholes or [warp-drive technology](#), this first obstacle may be a non-starter, says Frank.

“Anything going faster than light is science fiction right now because the laws of physics say that you can't do that,” he explains. “Speed of light is as fast as you're gonna go.”

Alien Engineering

Even if aliens did crack the code on the galactic speed limit, they could still face other problems, says [Scott McCormack](#), Ph.D., an assistant professor of materials science and engineering at University of California, Davis, whose work focuses on engineering for extreme environments like space.

In addition to designing probes to combat weathering effects of things like space radiation, alien engineers would also need to build probes to withstand being pelted by [space debris](#) on the long journey to Earth. This would entail designing new materials that had a combination of material “toughness” as well as “hardness,” McCormack says.



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“Toughness is typically the ability of the material to absorb energy, [and] materials that are hard [like diamonds] tend to have a lower toughness,” he says. “To resist these impacts, you want to have a material that’s going to have both high hardness [to resist being deformed] and high fracture toughness. What material could that be? I don’t think we have an answer yet.” If the aliens had sea life similar to Earth’s, one potential avenue would be to design probe materials made to mimic the mother-of-pearl material found in mollusk shells, called [nacre](#). At the nanoscale, McCormack

explains that these shells create almost a brick-and-mortar design where the carbon-composite nacre material is cushioned by layers of organic materials. As a result, these shells exhibit high levels of hardness and toughness that scientists are also exploring as a material for [building nuclear fusion reactors](#).

As for what these probes might look like, McCormack guesses they'll look less like NASA's Voyager or New Horizons probes and more like Oumuamua.

"My brain initially goes to a needle going through space, because the needle is going to have the smallest cross-sectional area in the direction it's moving," McCormack says. "You [would] have a lower chance of actually hitting another object."

Saying "Hello" to Aliens

Let's say aliens were able to overcome these physics and design constraints to create sturdy probes that can travel all the way to our solar system; how would we know they're there? One approach is to search for something called "[technosignatures](#)" using radio telescopes.

[Steve Croft](#), Ph.D., is a project scientist on the Breakthrough Listen team based at the University of California, Berkeley, and [Peter Ma](#) is a research intern for Breakthrough Listen, based at the University of Toronto. This team uses the Green Bank radio telescope in West Virginia to look for anomalous signals in radio data that seem out of place with background radio signals.

"If we were trying to get somebody's attention, what would we do?" asks Croft. "Maybe it's packing a lot of energy into a very narrow range of frequencies, or packing a lot of energy into a very short burst. ... That stands out from the natural background of astrophysical signals."

While it may seem unlikely to an untrained observer that aliens would only be communicating in radio signals, Ma points out that radio communications would not only be a telltale sign that these civilizations are making other astronomical observations, but would also be an energy-efficient communication method.

The Breakthrough Listen team hasn't intercepted any [alien messages](#) yet, but they're scouring the skies just in case. As for communicating back to an alien message, should they find one, that will be a much bigger conversation, Croft says.

"Stage one would be 'should we respond?'" Croft says. "And then stage two, if we do [respond], would be to build a broad coalition of people to plan what message should be sent back."



SARAH WELLS

Sarah is a science and technology journalist based in Boston interested in how innovation and research intersect with our daily lives. She has written for a number of national publications and covers innovation news at *Inverse*.