

Harvard professor Avi Loeb says he found interstellar objects in the deep sea. Others are skeptical: Peers question whether evidence is sufficiently extraordinary to prove an extraordinary claim

By [Elizabeth Hlavinka](#)

In 2014, a meteorite dubbed IM1 broke apart over the Pacific Ocean, casting at least 700 remnants into the ocean near Papua New Guinea, according to Avi Loeb, Ph.D., a theoretical astrophysicist at Harvard. In new research, Loeb says his team found evidence in 57 of these shiny spherules that suggests they [came from outside our solar system](#), making them the "first recognized [interstellar](#) object bigger than half a meter in size."

"This is the first time that scientists analyzed materials from such an object, so that's a historic discovery already," Loeb told Salon in a video call.

The claims, dispersed in a [press release](#) and [paper](#) that has not been peer-reviewed or accepted in a journal, are extraordinary, to say the least. Loeb barely has time in the day this week to field reporters questioning him about his findings. And for good reason: If corroborated, a discovery like this could change how we think about life in this solar system by providing clues into how it operates in others.

[Why one Harvard scientist believes alien technology may be sitting on the ocean floor](#)

Loeb is the longest-running chair of the astronomy department at Harvard University and has published more than 800 scientific papers. But he has become a source of controversy in the scientific community for making what [The New York Times](#) called "outlandish declarations that are too strong and too hasty." Some of his peers are hesitant to accept these new findings and are [critical](#) of his approach to the scientific method, which involves widely disseminating his work to the media before following the typical peer-review process.

"The closest analogy to his approach to the scientific method is the way that a bull approaches a china shop," said Ethan R. Siegel, Ph.D., a theoretical astrophysicist and science communicator. "What Loeb has been doing with not only this one particular interstellar claim but in a troubling pattern of claims that has been going on for several years, is failing to be his own harshest critic. Instead, [he] behaves like a religious zealot about his alleged discoveries."

Loeb counters that scientists should be transparent with the public throughout every step of their process. During and after his Galileo Mission, in which he used a deep-sea, magnetic rake to scoop up these mysterious spherules, he wrote more than 40 publicly available [blog entries](#) about his findings. He argues that greater transparency in science can [help build trust](#) in a community that has begun to lose the public's confidence in recent years.

"Those people who make these comments don't do much; they sit on their chairs and display negativity," Loeb said. "If they have a better method of doing science, they should let me know,

but the way I was educated is that you need to collect the evidence, analyze it and publish it in a scientific paper. What I do differently is I also communicate with the public."

Donald Brownlee, Ph.D., an astronomer at the University of Washington who has spent his career studying cosmic remnants like meteorites and stardust, pointed to Carl Sagan's quote, "Extraordinary claims require extraordinary evidence," when asked about Loeb's research.

"What they found is interesting — they didn't come back empty-handed," Brownlee told Salon in a phone interview. "They came back with real extraterrestrial material and clearly in that are some particles that are quite mysterious for the reasons they describe."

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Loeb says traces of three rare elements — beryllium, lanthanum and uranium — suggest the spheres come from outside of our solar system. He hypothesizes they could have originated from a magma ocean on a planet with an iron core or a region near an exploding star that was enriched with these elements. Or, he says, it could be technological in origin, meaning it was manufactured by aliens.

Brownlee said the prevalence of these elements is not sufficient proof to determine if they are from outside our solar system or even outside our planet. The answer to whether they are indeed interstellar in origin instead lies in the sphere's isotopes, or various forms of the same element with different numbers of neutrons, rather than the abundance of certain elements, Brownlee said.

"The ratio of isotopes of uranium 238 to 225 on our planet is different than anywhere else in the universe because the two isotopes decay at different timescales," Brownlee said. "So uranium from outside the solar system would have been totally different isotopically than ours."

Steven Desch, Ph.D., an astrophysics professor at Arizona State University who researches small grains and meteorites, said the data Loeb presents regarding the isotopic makeup of the spherules suggests they are instead something from within our solar system that was manipulated when it passed through the atmosphere.

"I don't know exactly what this composition is telling us except I do see that, broadly, it's pretty similar to other types of micrometeorites that have ended up on the bottom of the ocean," Desch told Salon in a phone interview, citing a 2016 [study](#) that found similar spheres made up of rare elements that were also collected from the ocean floor. "Right away that tells us they're maybe just asteroids in our own solar system."

Loeb says additional evidence comes from the trajectory of IM1 as it passed through the atmosphere and broke apart before entering the ocean as spherules. The idea is embedded in the fact that the spherules maintained their composition without being completely demolished en route, which shows they are "tougher than all space rock cataloged by NASA over the past decade, including iron meteorites," he said.

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But Desch says the speed at which an interstellar meteorite of this composition entered the atmosphere would burn everything up and there wouldn't be any spherules like these left. On the other hand, if it came from within our solar system, it could have gone slow enough to break apart and fall into the ocean, scattering spherules like these.

"This is aside from the parts that they actually do not know where it crashed or exploded, and they actually do not seem to realize how much it's spread out by ocean currents and things like that," Desch said.

In 2017, Loeb famously said another interstellar object known as [Oumuamua](#) — meaning "scout" or "messenger" in Hawaiian — [could have been a form of alien technology](#) visiting us from a distant star. He even [published a book](#) about his findings in January 2021. But just a couple of months later, Desch published a contradictory [paper](#) that found Oumuamua was actually an icy piece of rock from a Pluto-like planet.

This back-and-forth is a lot to keep up with, and Desch says Loeb going to the media without having his work peer-reviewed risks losing even more of the public's trust in the scientific community.

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Some scientists contacted for this story declined to comment on Loeb's contradictory findings. Karl Gebhardt, Ph.D., an astrophysics professor at the University of Texas at Austin who studies black holes and the formation of galaxies, said a "toxic" culture has developed around Loeb's research. Though Gebhardt said he was excited by his research and applauded his efforts, he said Loeb is quick to dismiss feedback from his peers and sometimes aggressively cuts off collaboration within the scientific community.

"I am glad to hear he has submitted something to some journal," Gebhardt told Salon in an email. "That does not necessarily imply the community will engage with him, since he has burned so many bridges already."

Brownlee said Loeb is "quite a self-promoter," although he noted that could be necessary for an expedition like this, which cost \$1.5 million and was funded by donations from a cryptocurrency entrepreneur. Loeb dispersed the press release on the same day he released another [book](#) about the Galileo Mission, in which he waxes philosophical about the likelihood that we are not alone in the universe.

During the expedition, Loeb was followed by a film crew interested in making a documentary about the retrieval of the spherules. On his daily morning jog one day on the deck of the ship, the director [asked](#) him whether he was running away or towards something.

He replied, "Both. I am running away from some of my colleagues and towards a higher intelligence in interstellar space."

