SCIENCE

A Harvard professor is risking his reputation to search for aliens. Tech tycoons are bankrolling his quest.

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Avi Loeb is looking for alien tech on Earth, drawing ire from his colleagues.

The Harvard professor's research is bankrolled by tech tycoons "pissed off" at academia's dogma.

Some critics say Loeb is overreaching for public acclaim.

Harvard astrophysicist Avi Loeb thinks it's time for the scientific community to get over its bias against UFOs.

In the past few years, the renegade professor has set the astrophysics world on fire by claiming that it was reasonable to suggest extraterrestrial intelligence was behind two recent discoveries.

Several of Loeb's peers are galled. They say he's overreaching, repeating the axiom that an extraordinary claim requires extraordinary evidence.

"Loeb is on a mission to find aliens. He believes he sees something in the data hundreds of experts don't, and he wants to make you believe too," Steven Desch, an astrophysicist at Arizona State University, told Business Insider.

Loeb argues that while we haven't yet found any evidence of aliens, this may be precisely because scientists have been so reluctant to look for them.

"Obviously, they will never have extraordinary evidence if they're not seeking it," Loeb told BI. "The question of whether we are alone and whether we actually have a partner out there, a neighbor, is perhaps the most fundamental in science," he said.

While Loeb's claims and camera-ready charm have grated on some in academia, they've amassed for him a loving and growing fan base outside the ivory tower. His work is the subject of an upcoming Netflix

documentary. There is also an upcoming off-Broadway show about his life, in which he plans to star. Among his most avid fans are wealthy tech tycoons who see him as one of them: a disruptor. And they are the ones bankrolling perhaps Loeb's most ambitious work to date, The Galileo Project: A research program devoted to seeking the extraordinary evidence that we are not alone.

"I do believe sometimes he steps a little bit too far," said Charles Hoskinson, a cryptocurrency magnate and mathematician. But this boundary-pushing is exactly why he's backed Loeb's research. "That's what you take when you take a very passionate, very aggressive type A personality that's constantly working and thinking and who wants to be right — you have to accept that every now and then they're just going to make bold statements."

A puzzling interstellar visitor

Avi Loeb poses for a photo during exclusive interview at his home in Lexington, Massachusetts, United States on August 8, 2023. Anibal Martel/Anadolu Agency via Getty Image

For most of Loeb's nearly 40-year career in astrophysics, aliens were far from his orbit of influence.

For decades, he published theoretical works about black holes, exoplanets, and other cosmic events, which drew acclaim from distinguished astrophysicists and brought him prestigious appointments, including a professorship at Harvard and an advisory role with Breakthrough Initiatives, a space research body with links to Mark Zuckerberg and the late Stephen Hawking.

Physicist Avi Loeb, right, on stage with physicist Stephen Hawking and others in New York in 2016. Lucas Jackson/Reuters

Then, in 2017, a strange object was discovered floating in our solar system, and what Loeb postulated about where it came from rocked the world of astrophysics.

Scientists at the University of Hawaii spotted 'Oumuamua, a quarter-mile-long object wandering around the Milky Way. It was the first time scientists recognized an object from interstellar space visiting the solar system.

The discovery was revolutionary, but also puzzling. 'Oumuamua had a very unusual shape and didn't have the dust, ice, or characteristic tail of a comet. But it did speed up as it left the solar system, which is typical of a comet. Physicists were stumped.

"The more data we got about it, the less familiar it looked," said Loeb.

Artist's impression of 'Oumuamua. ESO/M. Kornmesser

A range of explanations emerged. Desch and his colleagues suggested 'Oumuamua was a piece of a Pluto-like planet.

Another team postulated that the object is a new type of comet sporting an invisible tail made of vaporized hydrogen. Loeb disagrees with this interpretation and has explained his arguments in peer-reviewed published articles.

For him, one hypothesis deserved serious examination: What if 'Oumuamua was actually the first example of alien tech spotted in our solar system? Maybe the object was a piece of a solar sail from an extraterrestrial spacecraft.

"It's not a conclusion. It's more of: let's imagine what's possible and allow it! Not dismiss it ahead of time," said Loeb.

A picture shows what Oumuamua really looks like. It is surrounded by the trails of faint stars that are smeared as the telescopes tracked the object, ESO/K. Meech et al

Loeb's theory was picked up by international media and quickly drew criticism from his peers.

Academic convention dictates scientists support their theories with a solid basis of evidence. Many consider it good practice to discuss and validate these kinds of ideas with peers before sharing them widely. Several quickly spoke up to debunk the idea that 'Oumuamua could be technological in origin.

This "unfortunately created a bit of a schism in the astrophysics community," said Hoskinson. He went from "one of the most respected, highly cited and loved astrophysicists" to people alleging that he was "hurting astronomy," Hoskinson said.

Rather than recant, Loeb decided he would seek more evidence of extraterrestrial intelligence. "I wrote more than 1,000 papers in theoretical astrophysics. As I got older, I realized that it's more important to pay attention to evidence than to opinion and theoretical ideas," he said. In 2021, he announced that he had secured $1.75 million in funding to launch the Galileo Project, an institute devoted to seeking signs of extraterrestrial technology on and near our planet.

Avi Loeb posing for a picture in 2019 in Cambridge, Massachussetts. Lane Turner/The Boston Globe via Getty Images

Looking for aliens in our backyard

Loeb is far from alone in seeking signs of life beyond our pale blue dot. Bioastronomers are using observatories like NASA's James Webb Telescope to search for chemical signatures of life on exoplanets — planets outside of our solar system. NASA is also sending probes to see if there are signs of life within the solar system. Other scientists are looking for "techno signatures," such as radio signals that could lead to other civilizations.

These quests have "barely scratched the surface in terms of what anybody would consider a comprehensive search," said Bill Diamond, President and CEO of the SETI Institute. "We've done the equivalent of sticking a measuring cup in the ocean and trying to understand our oceans based on what's in that measuring cup."

An artist's illustration of exoplanets NASA/W. Stenzel

Where Loeb sets himself apart is that he's seeking evidence that he thinks may exist right in our backyard, around or even on the Earth.

"If any space trash was sent out by other civilizations that predated, let's say, by a billion years, that's enough time to cross the Milky Way

galaxy with the kind of spacecraft that we launched from one side to the other," he said.

"Perhaps those things reached us by now and they are moving too slow to escape from the Milky Way galaxy. So they will stay bound and they will keep accumulating over time, just like plastics in the ocean," he added.

One thing animating his search is the public's interest in government reports of unidentified aerial phenomena, or UAPs.

A 2021 survey from the Pew Research Center found that about half of Americans believe that the US military has spotted evidence of alien technology.

A video released by the Department of Defense in 2020 shows an example of a UAP
Department of Defense

The US government's All-domain Anomaly Resolution Office (AARO) — established in 2022 to collect sightings from military personnel and sensors — said last year it was analyzing more than 801 UAP events. To be clear, an UAP doesn't mean an alien. It is an object, airborne or not, that was not readily identifiable or acted in a way that can't be immediately explained within the current understanding of technology. NASA and AARO recently scrutinized available UAP data. Both agreed that there's no proof that extraterrestrial beings or tech have ever visited the Earth.

Loeb agrees. But he also thinks government agencies are in a bad position to analyze this information. UAP reports are generally of very poor quality, and defense organizations have little incentive to push for a more thorough investigation, as they tend to be more concerned about national security than little green men.

Because these are collected as part of military operations, these reports are also mired in secrecy, which only fuels conspiracy theories, he said.

Loeb believes that to best serve the public's interest in UAPs, scientists should be at the helm. They should be collecting independent high-quality data that can be shared openly without concern for military defense. And now they have the technology to do it, between high-quality telescopes and AI that can sort through hours of video. UAPs, Loeb argues, are "low-hanging fruit" in the search for alien intelligence.

"The whole point is to bring it to the realm of science. I'm trying to change the narrative," he said

Loeb doubts he would get conventional funding agencies to back his research. He said the astrophysics community has a bias against this line of research.

"What they often argue is that it would be a waste of taxpayers' money if we were to fund the risky research," he said. "The problem is that they don't ask the taxpayers what they really care about." But Loeb hasn't

had to put his theory about public funding to the test.

Catnip for tech tycoons

To date, The Galileo Project raised some $5 million, per Loeb, the majority of which came from private donations from multi-millionaires that he says were unsolicited.

Much of those funds are courtesy of his rising public persona as an innovative disruptor. This began to take off with "Extraterrestrial: The First Sign of Intelligent Life Beyond Earth," his 2021 book that set out his theories on 'Oumuamua's technological origins. His blog and dozens of interviews about his book, including on Joe Rogan's podcast, attracted many fans, including some who are rich and "pissed off" at academia turning its nose up at unconventional research.

One was Eugene Jhong, a philanthropist and former tech exec. In an email, he told BI that he likes to fund contrarian researchers. "There's a pretty toxic atmosphere of ridicule and condescension in many areas," he said, which he wants to oppose.

Loeb said $250,000 from Jhong showed up on his research account a few months after the publication of his book, with no explanation and no expectations. This became the Galileo Project's first seed money.

"I never heard of him and he gave the money simply because he was inspired. He heard me speak on a podcast," said Loeb. "After we met over Zoom, he gave another million dollars," he said.

A few other wealthy individuals "just showed up on my porch and were asking me about my work," said Loeb.

Among them was Frank Laukien, CEO of the American scientific instrument manufacturer Bruker Corporation, whose net value stands at about $3.4 billion. Laukien became a cofounder of the Galileo Project.

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The Galileo Project also drew prestigious experts. Its advisory board counts scientists like Charles Alcock, former director of Harvard and Smithsonian's Center for Astrophysics and Seth Shostak, Senior Astronomer, SETI Institute, as well as venture capitalist Rizwan Virk, a founder of MIT tech accelerator Play Labs, and Stephen Wolfram Founder, CEO of tech multinational computational company Wolfram Research.

Loeb's prominence in monied circles continues to grow. Last year, he was invited to speak at Richard Branson's Necker Island, an event attended by at least 40 people "each worth more than $400 million," said Loeb.

Hoskinson, the crypto entrepreneur, says he was persuaded to double down on Loeb by a mixture of his attitude, the credentials of experts who work with him, and the backlash he faced.

"I got a little pissed off with the astronomy community, I think there's a lot of arrogance and childish behavior that the community has," said Hoskinson, who also notably bankrolled Colossal, the firm that wants to bring back the woolly mammoth.

The Galileo Project's most controversial endeavor took Loeb on a deep-sea cruise

With all this funding, Loeb has grand ambitions for the Galileo Project.

He set up an observatory on Harvard University property that tracks hundreds of thousands of aerial objects using visible light, infrared, sound, and radio. The data, which has been collected since November, is being fed to machine-learning software that is figuring out how to differentiate unusual objects from birds, balloons, drones, airplanes, or satellites. A second observatory for this work is being assembled in Colorado. Each costs about $500,000, Loeb said.

He also plans to use the data from the upcoming Legacy Survey of Space and Time at the Vera C Rubin Observatory in Chile, feeding it

through AI systems to search for 'Oumuamua-like objects.

One of the Galileo Project's biggest endeavors may be its most controversial: a boat trip near Papua New Guinea looking for bits of an interstellar meteor — and possibly alien tech — at the bottom of the ocean.

The idea was to find the remnants of a meteor that crashed into Earth in 2014, which Loeb believed were worth checking for signs of alien crafting.

Loeb and a collaborator are shown during the interstellar salvage expedition in June 2023. Avi Loeb

Loeb previously said a 2022 memo from US Space Command set him on this path.

In it, scientists suggested an object that exploded in a fireball in Earth's atmosphere in 2014 came from interstellar space. Others have contested that assessment.

Loeb's expedition to find what's left of the object, which cost $1.5 million, took place in 2023. It brought together prestigious names, including Rob McCallum, a navigator known for his work diving to the Mariana Trench with James Cameron, who led the operation.

It was fully subsidized by Hoskinson, who saw it as a "template" to recover interstellar objects from the ocean floor.

A picture shows Loeb and the team of the interstellar salvage expedition in June 2023. Avi Loeb

Hoskinson, who joined Loeb on the expedition, said the trip was followed by a documentary team commissioned by Netflix, details of which have not been publicly disclosed. Netflix did not respond to BI's request for comment.

"This is going to create a lot of exposure and if we do this in just the right way, it could create a good perpetual funding stream for Avi's research," said Hoskinson.

Loeb on the IM1 expedition. Avi Loeb

Pinning hope on tiny metal balls

Dredging the bottom of the ocean with a magnetic sled, the team recovered what they believe to be material left behind by the interstellar object — tiny metallic balls they called "BeLaU" spherules.

Loeb and his colleagues' analysis, led with Harvard's Stein Jacobsen, a professor of geochemistry, suggests they were indeed made up of weird stuff.

Small metallic spheres, recovered from the bottom of the ocean, are shown here. Avi Loeb

They were particularly rich in the heavy metal elements beryllium, lanthanum, and uranium and carried some peculiar isotopes.

"They had the composition of elements from the periodic table that looked very different from materials on Earth and Mars, the Moon, or asteroids," said Loeb.

The work on the BeLaU spherules was published in August 2023 on the online forum arXiv, where scientific articles are shared before they undergo the rigorous process of peer review.

There again, Loeb didn't hold back. One possibility, the paper said, was that the meteor was a bit of an alien planet that burst and made its way to Earth. Another was "an extraterrestrial technological origin."

Loeb and colleagues remove material the magnetic sled that they used to dredge the ocean.
Avi Loeb

Like with 'Oumuamua, this statement attracted media attention and backlash from his colleagues.

Some proposed alternate explanations and critiqued the work.

In a post for The Conversation, Monica Grady, a professor of planetary and space sciences at the UK's Open University, said Loeb's evidence was "rather shaky."

Patricio Gallardo, a research fellow at the University of Chicago, published a non-peer-reviewed analysis suggesting a prosaic origin for the balls: runoff from industrial pollution created by coal ash.

Desch, the astrophysicist from Arizona University, posted a critique of Loeb's work on arXiv alleging "multiple fatal flaws with the manuscript's arguments."

A later analysis, co-authored by Desch, also questioned how Loeb's team tracked down the meteor, alleging they were misled by a seismometer picking up vibrations from nearby passing traffic. These analyses were not peer-reviewed.

Desch told BI in an email that he thinks Loeb "stopped being a scientist some time ago." He said Loeb was "a convincing salesman and public figure," and previously said several of his colleagues had decided to stop engaging in peer review with Loeb.

"Scientists who are naturally curious about the world and trying to understand it and propose hypotheses do not immediately put out a press report, which basically does draw conclusions," he said.

A close up of the tiny spherules, seen here in an electron microscope. The bar scale is about 100 micrometers. Loeb et all, arXiv:2401.09882 [astro-ph.EP] https://doi.org/10.48550/arXiv.2401.09882 CC-BY

Loeb says the arguments raised against his interpretation of the data don't hold water.

According to a research note published by his team, which was not

peer-reviewed, the spherules' chemical composition cannot be explained by coal ash runoff.

In an email to BI, Loeb rebutted allegations that he was not looking for the meteor in the right place. He said his team was "primarily informed" by U.S. Government satellites, rather than the seismometer's reading, a point that was mentioned in an article on arXiv.

He disagrees vehemently with his critics. "I'm doing the heavy lifting — I'm going to the Pacific Ocean, collecting materials, analyzing them, it takes months and months," he said. "You ask yourself, why is this hostility?" Loeb thinks it's partly because of "jealousy" of the public attention.

He is not the only one feeling the pressure from the space science community. In a report published last year, NASA said members of a panel it tasked with investigating UAPs were targeted by hate mail, ridiculed and criticized on social media, and warned they risked losing their scientific credibility.

"Such criticism, either by detractors or by proponents of the extraterrestrial hypothesis, are anathema to the scientific method, which NASA always has and will continue to promote in an objective and open-minded fashion," the report said.

Diamond, the SETI Institute CEO, told BI he had "mixed feelings" about Loeb's approach. Loeb's provocative take is probably what allowed him to generate cash for a field that has long been underfunded, he said. On the other hand, he added, "I think that there are many in the scientific community who feel that he's gone beyond the bounds and confines of the scientific method and scientific rigor. And there's some sensationalism there, part of which may be an effort to help sell books, which of course is understandable," he said. Still, Diamond said, "what Avi's proposing to do is a worthwhile endeavor."

Hoskinson supports Loeb's position. But he thinks he may have overstepped when raising, in a scientific paper, that the spherules could have come from extraterrestrial technology.

"The strongest statement I think you can make with the samples we

recovered is that there's a good possibility it came from a different solar system, but you can't really go beyond that," he said.

Hoskinson, who is an author on the paper, said Loeb didn't run his statement past him or his team before publication.

"We're reviewing the manuscript and he's like: 'yeah, technological origin!' And I'm like 'you son of a bitch!'," said Hoskinson jokingly. "He snuck it in. That's Avi."

Harvard astrophysicist Avi Loeb recently offered two suggestions for how Harvard can restore its prestige. Adam Glanzman for The Washington Post via Getty Images

In an email to BI, Loeb flagged that the mention of extraterrestrial tech was removed from a final version of the paper describing the chemical composition of the spherules.

He and a colleague also recently laid out calculations to further support a natural source for the meteor. The meteor's observed speed before it hit the Earth, they say, fits with the idea that it may have come from a rocky planet outside of the solar system destroyed by a nearby dwarf star. This was explained in a paper due to be published in the peer-reviewed journal Astronomy & Astrophysics.

The original version of the article remains online. Asked whether he no longer believes in a possible technological origin for the meteor, Loeb said they need to investigate further. "We need to find larger pieces of the object in order to reach definitive conclusions."

He is planning another expedition to the site of IM1 in the hopes of finding bigger chunks of the meteor. This time, instead of a magnet, he plans to use a remotely operated vehicle with a video feed, which should help spot any bigger chunks left behind. "If we find a rock with a BeLaU composition, it will confirm a planetary origin," he told BI.

Loeb says he is doing his work for the little guy.

"Very often scientists are nerds, you know? They get to the highest level of sophistication, use abstract language with acronyms that the public doesn't understand," he said.

"Even if I don't find anything, I would feel that at least I tried to fulfill the wishes or the interests of many people."

Loeb's quest to find aliens may only just be beginning as the enthralment of anti-establishment elites is unlikely to fade in the face of growing criticism. As he plans more extravagant expeditions to prove the origin of the interstellar meteor, Loeb likens his critics to crows pecking at the neck of an eagle.

"Rather than fight the crow off, the eagle rises to greater heights where the oxygen level is too low for the crow, and so the crow drops voluntarily off the eagle's back," he said. "Similarly, I strive to rise to the greatest heights of data collection and scientific analysis where my critics will not have enough oxygen to survive."

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