

Fishing in Interstellar Space

By Avi Loeb on December 26, 2021

My routine to jog each morning at sunrise ignores whether the weather app on my electronic watch forecasts pouring rain or snow. Experiencing nature is refreshing even if it means getting soaking wet. But the most refreshing fact is that I always have company. The space between the sky and the ground is full of life in the form of birds. And there are many more small birds than large birds.

Would it not be natural, by extrapolation, to expect interstellar space to be full of travelers that signal extraterrestrial life? Shouldn't we search, not regarding their possible existence as "extraordinary" but rather expecting them? Based on my morning experience, there might be more of them - the smaller they are.

In 2005, the US Congress [tasked](#) NASA to find 90 percent of all objects larger than the size of a football field (450 feet or equivalently 140 meters) on trajectories which may collide with Earth. Towards this goal, the [Pan STARRS](#) observatory provided the first exhaustive survey of the sky for [Near-Earth Objects](#) (NEOs). In the process of doing so, it discovered unexpectedly [`Oumuamua](#), the first weird interstellar object within the orbit of the Earth around the Sun. But the upcoming [Legacy Survey of Space and Time](#) (LSST) on the *Vera Rubin Observatory* would be able to detect reflected sunlight from objects that are ten times smaller than `Oumuamua within the same region. This new "fishing net" would have smaller holes and could capture many more "fish" smaller than `Oumuamua.

Enrico Fermi's [asked](#): "where is everybody?", like an empty-handed fisherman without equipment, looking at the ocean and asking "where are all the fish?"

What Enrico Fermi missed is that extraordinary evidence requires extraordinary funding. Interstellar space is vast and travel time is measured in billions of years, and so sensitive telescopes and patience are needed for a successful interstellar fishing experience.

If Enrico Fermi was alive today, I would have invited him to become a research team member of the [Galileo Project](#), about to construct its first telescope system on the roof of the [Harvard College Observatory](#) in the coming months. This system will extend my morning jog experience by taking a continuous video of the entire sky, using optical, infrared, radio and audio sensors. The hardware will be supplemented by artificial intelligence algorithms that would distinguish birds, drones and airplanes from other travelers. Once the first telescope system will perform successfully, the [Galileo Project](#) team will make copies of it and distribute them in various geographical locations.

Past astronomical surveys could have missed numerous interstellar objects; not only those smaller than `Oumuamua within the Earth-Sun separation, but also those which travel much faster than one part in ten thousand of the speed of light (namely tens of thousands of miles per second), the characteristic speed of Solar system objects near Earth.

For example, a relativistic spacecraft - as envisioned by the [Starshot Initiative](#), traveling a thousand times faster than comets, asteroids or chemical rockets, would have been missed by existing search algorithms used by astronomers. With the Galileo team member, Thiem Hoang, I wrote a [paper](#) showing that the heat generated by an `Oumuamua-size object moving at a tenth of the speed of light, could be detected out to a distance of a hundred times the Earth-Sun separation with the new [James Webb Space Telescope](#).

The former Director of National Intelligence, John Ratcliffe, made an interesting statement about *Unidentified Aerial Phenomena* (UAP, also called UFOs), as reported in a [Guardian article](#) on March 22, 2021: "we are talking about objects that have been seen by navy or air force pilots, or have been picked up by satellite imagery, that frankly engage in actions that are difficult to explain, movements that are hard to replicate, that we don't have the technology for."

The part that caught my attention is the reference to "satellite imagery" because I had never seen any publicly released data on that. The hundred scientists engaged in the [Galileo Project](#) would be extremely interested in analyzing any data on objects that enter the Earth's atmosphere and do not follow ballistic orbits like meteors. But no such data is currently available to open scientific analysis.

Of course, Ratcliffe's quote is an insufficient basis for substantive scientific inquiry. But unclassified data, assembled by non-governmental satellites, could be made available to open scientific analysis by the [Galileo Project](#).

Progress in our understanding of the related satellite imagery data may also stem from the [new office](#) established recently by the National Defense Authorization Act (NDAA) for fiscal year 2022. The office, to be created by mid-2022, will have the authority to start a coordinated effort of reporting and responding to UAP and significantly improve data-sharing between agencies on UAP sightings. This new office will be administered jointly between the Secretary of Defense and the Director of National Intelligence, and will empower military and civilian personnel as well as the Intelligence Community to report incidents and information involving UAP. If the new office will determine that the objects in the satellite imagery data are so unusual that they cannot be human made and hence are not a matter of national security, then it would make sense to subject the data to scientific analysis.

The [Galileo Project](#) data will be open to the public and its analysis will be transparent. The related scientific findings would expand humanity's knowledge, with no attention to borders between nations.

My morning jog teaches me to love nature irrespective of what it entails, from birds to extraterrestrial equipment.

ABOUT THE AUTHOR



Avi Loeb is the head of the Galileo Project, founding director of Harvard University's - Black Hole Initiative, director of the Institute for Theory and Computation at the Harvard-Smithsonian Center for Astrophysics, and the former chair of the astronomy department at Harvard University (2011-2020). He chairs the advisory board for the Breakthrough Starshot project, and is a former member of the President's Council of Advisors on Science and Technology and a former chair of the Board on Physics and Astronomy of the National Academies. He is the bestselling author of "[*Extraterrestrial: The First Sign of Intelligent Life Beyond Earth*](#)" and a co-author of the textbook "[*Life in the Cosmos*](#)", both published in 2021.