

INTERVIEW

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BIO

Dr Abraham Loeb

Loeb is a theoretical physicist and the Frank B. Baird Jr. professor of science at Harvard University, where he is also director of the Black Hole Initiative and the Institute for Theory and Computation. Loeb is the author of five books and 800 scientific papers. In 2012 *Time* selected him as one of the 25 most influential people in space. His most recent book *Extraterrestrial: The First Sign of Intelligent Life Beyond Earth* has caused quite the stir in the scientific community.



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“‘OUMUAMUA MAY HAVE AN ARTIFICIAL ORIGIN”

A Harvard astrophysicist shaking things up in the scientific community, Avi Loeb speaks to **All About Space** about his views on extraterrestrial intelligence and the search for life beyond Earth

Interviewed by Daisy Dobrijevic

What do you think 'Oumuamua is?

It was the first object from outside the Solar System that we spotted nearby. It's like finding an object in your backyard from the street. Then instead of you making the trip to the street you can figure out what's in the street from looking at this object, so by that alone it's intriguing.

Most astronomers thought that it must be a comet. However, it didn't show a cometary tail. The Spitzer Space Telescope also searched very deeply around it, and couldn't detect any carbon-based molecules or dust, so clearly it's not a comet. It also didn't behave like an asteroid; it was pushed away from the Sun with an additional force that declined inversely with distance squared smoothly. Usually we get that from the evaporation of an object through the rocket effect - from cometary gases pushing it. However, there were no cometary gases.

The only interpretation I could give to it was reflection of sunlight, but for that it needed to be very thin. The best model was that of a pancake-shaped object. I suggested maybe it's a lightsail,

but nature doesn't make lightsails, so it must be artificial in that case.

A few months ago, in September 2020, there was another object detected which also exhibited the push away from the Sun by reflecting sunlight and didn't have a cometary tail. It was given the name 2020 SO, and was traced to be a rocket booster that was launched in 1966. That's the fundamental question: is 'Oumuamua natural, or is it artificial? I'm still arguing that an artificial origin is a viable possibility that we should explore accordingly.

Do you think controversy drives discovery?

Yes. If there is something new that we haven't thought about, that takes us away from preconceptions, from prejudice, obviously it will be controversial. However, you would expect scientists to be open-minded and entertain possibilities that do not match what they were thinking about before - unfortunately that's not the case.

My colleagues tend to say that extraordinary claims require extraordinary evidence, but I

claim that extraordinary conservatism leads to extraordinary ignorance.

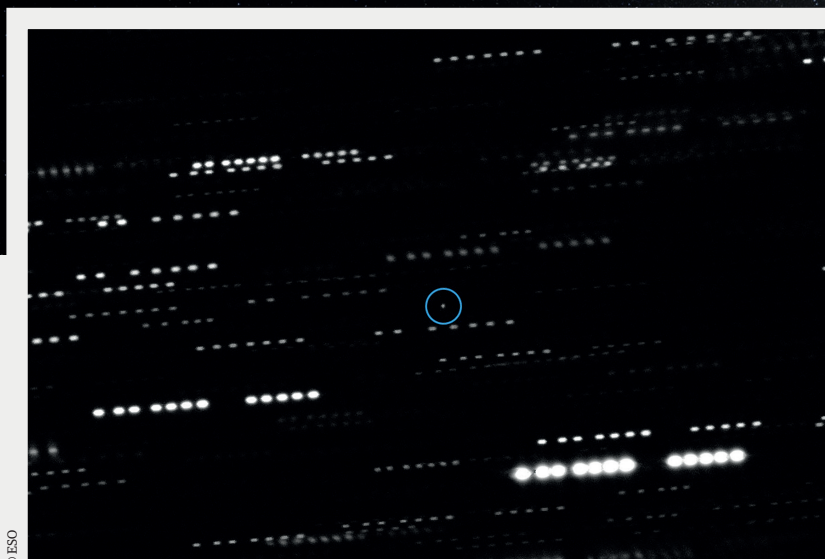
Did you expect such a buzz from your new book?

No, it went well beyond my expectations by an order of magnitude. I've had about 250 interviews, and there were more than 20 filmmakers and producers from Hollywood that contacted us with interest in the book. Can you believe it?

It's clear from this that the public was starved on the subject for a very long time by the scientific community. The fact that they see a scientist openly discussing it, and there is this object that potentially could be of interest, opens a new window into the search.

My main motivation was putting this question - are we the smartest kid on the block? - on the table. I think it's extremely important for humanity, because it could make us modest. If we realise that we are not the smartest, it will give us a better perspective about our place in the universe, religious beliefs and so forth. I don't think there

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Left: Very deep combined image of 'Oumuamua (circled)

is any other scientific question that has more impact than that, and at the same time it has been completely ignored, that's the amazing thing.

Do you think your appreciation of philosophy has given you a unique perspective on science?

Definitely, but there is also the fact that I grew up on a farm. I used to collect eggs every afternoon, and drive a tractor to the hills of the village on weekends and read philosophy books. That connected me to nature much more than to people. I was not a social animal. I wasn't going to parties like the city people used to do. I think independently, and that you can trace to the farm.

When I see people saying 'it's a rock, it's definitely a rock, I don't care', I want to understand. Does it make sense to say it's a rock or not? Scientists, they

become world experts, and that was the advice I was given, to become a world expert in one narrow thing. But I refused to do that, because I enjoyed the bigger reach.

You haven't always been involved in extraterrestrial research. What inspired you to take this particular path?

In 2007 I wrote a paper about searching for radio signals, eavesdropping on other civilisations, because I was working in cosmology. There was a new frontier that I helped pioneer, which was to build radio observatories that will search for the faint radiation from hydrogen in the early universe at very low radio frequencies.

The main obstacle was interference from radio and TV transmissions on Earth. I thought, oh, if it's

a problem for us on Earth, maybe we can eavesdrop on other civilisations.

Then in 2012 I visited Abu Dhabi, and the tour guide was bragging that the city lights are seen all the way to the Moon. I was wondering how far away can we see a city with the Hubble Space Telescope. It turns out that you can see it all the way to Pluto. If there was a city like Tokyo on Pluto, we would see it with the Hubble Space Telescope. That was my second encounter, the possibility of searching for artificial light.

In 2015 I wrote a paper about industrial pollution. An undergraduate came to me and wanted to work on something. I said, why don't we check if industrial pollution can be detected? 'Oumuamua showed up in 2017, and that's the trigger that lifted the boat. So yes, only over the past four years have I been really entrenched in this stuff.

When we search for extraterrestrial intelligence, what exactly are we looking for?

In the past 70 years or so we were looking for radio signals, but the problem with that approach is that it requires the counterpart to be alive. That limits the number of civilisations you can learn about. However, if you're looking for relics that are

Left: An artist's impression of 'Oumuamua

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There are lots of different ways, and our imagination is limited by the technologies that we develop. As we develop more and more, we'll have more to search for, because that will expand our imagination. But the archaeology part I think is already here, it's something we should do.

Do you think we should be focusing our resources on studying relics and space archeology rather than searching for signals?

I would definitely do that. In principle this approach allows you to put your hands on a physical object, and there is no substitute for that. Even if you detect a faint signal, the amount of information you have is very limited. If you have an archaeological object, there is a huge amount of information in it. You can maybe read the label and see where it came from. And of course it took these objects millions or billions of years to arrive at our doorstep, so it saves us the trip.

Why do you think we are so obsessed with the possibility of extraterrestrial life?

You can, in principle, be happy just eating good food and having the company of good friends, but to me that, well, that resembles what the dinosaurs used to do. They used to enjoy eating grass, and that was all fine until 66 million years ago, when a giant rock showed up the size of Manhattan Island, and the fun stopped when it hit the ground. You can ignore the sky most of the time, but every now and then it comes to haunt you.

I think the fascination is because it could be something really shocking. When you go out to meet someone, it's a good assumption that this person that you will meet shares qualities with you because you share the same genetic heritage from the distant past. But when you meet life from another planet that has had no contact with Earth whatsoever, it could be completely different. I think there is some fascination about the horror of meeting something totally different. It would shake our core beliefs, like how important we are and religious beliefs. If you look at most religions they focus on us, they don't focus on the possibility that there could be others.

Maybe it's better not to know what's out there... Scientific knowledge is always good, you can then

decide what to do with it. If you are not prepared, if you don't know reality well enough, you're just ignorant. Maybe there are predators out there in space... we want to know about it in advance.

Do you think we're alone in the universe?

No. We're so insignificant relative to the cosmos in many ways, both in terms of size and number of planets. We live for such a short time. We're put on this stage without a script; nobody told us what it's all about. I think we should act in modesty instead of claiming ownership of the stage or claiming arrogance. We should try to figure out what this stage is all about by looking at the universe and looking at how unusual it is.

Every time we thought that we were privileged and special, we were proven wrong in the past. So why not learn the lesson for once and for all and just try to figure out what's going on around you? Rather than saying it's never aliens, or it's always rocks and give me extraordinary evidence, what's the big deal? Why is that threatening the egos of so many people? I don't understand that.

We developed our technology only 100 years ago - that's a tiny window of opportunity. In the distant past we were not interesting, so Fermi's paradox, to me, is not really a paradox. It's possible that advanced civilisations don't really want to have contact with us because they have everything they need. They don't want to lower the quality of life by interacting with lower levels.

But that doesn't mean that we can never find out anything about them, because they still have to throw out the trash. We could be just like those investigative journalists that go through the trash cans of celebrities in Hollywood trying to find secrets of their private life.

Extraterrestrial

Loeb is the author of the controversial *Extraterrestrial: The First Sign of Intelligent Life Beyond Earth*, which is now available from all good bookshops and online retailers.

