Q&A with Avi Loeb, April 13, 2021

- **Why, except curiosity, is it so important to know if there's other intelligent life in the universe? How would it possibly change things here on Earth? Don't we have enough problems of our own? We already know we are on the brink of disaster due to our own actions. Why waste valuable time and money on research projects that are not devoted to our most urgent needs right here on planet Earth?**

  The discovery of a technological civilization beyond ours will have a major impact on our philosophical and religious perceptions of our place in the universe, our future on Earth, our aspirations for space. By identifying an interstellar object like `Oumuamua as a product of an advanced technology, we could plan to send a spacecraft like OSIRES-REx which landed on the asteroid Bennu and import this technology to Earth. This might save us million or billions of years of our own technological developments.

  Such a discovery will be the second Copernican revolution. It will demonstrate that not only we are not located at the center of the physical universe, as argued by the ancient Greek philosopher Aristotle, but also we might not be the smartest kid on the block. When my daughters were infants they tended to think that they are at the center of the world and that they are the smartest. They matured as soon as they went to the kindergarten and met other kids. Our civilization will mature only once we realize that others exist out there.

  Yes, we have to attend to all the problems on Earth but we also need an inspiration that gives meaning to our life. Oscar Wilde said: "We are all in the gutter, but some of us are looking at the stars". Earth is our home, but eventually we will have to move to space because the Sun will boil off all oceans on Earth in a billion years. Currently, all our eggs are in one basket; venturing into space could preserve some of what we hold precious from a single point catastrophe.

  Fundamentally, we are born into this world like actors put on a stage without a script. We should search for other actors on that stage and ask them what the play is about.

- **Why doesn't Oumuamua - a seemingly dead and lifeless object long 'out of order'- affirm the fruitlessness of the enterprise to discover life in the universe?**

  It is presumptuous to assume that we are worthy of special attention from advanced species in the Milky Way. We may be a phenomenon as uninteresting to them as ants are to us; after all, when we're walking down the sidewalk we rarely if ever examine every ant along our path.

  Our sun formed at the tail end of the star formation history of the universe. Most stars are billions of years older than ours. We also learned recently that of order half of all sun-like stars host an Earth-size planet in their habitable zone, allowing for liquid water and for the chemistry of life. Therefore, it is likely that technological civilizations predated us by billions of years and most of them are dead by now. We can search for their relics through what I call "space archaeology", studying each object that arrives to our vicinity from outside the Solar system.

Identifying artificial objects among the asteroids and comets in the Solar system is similar to searching for rare plastic bottles among the natural rocks on a beach. How can we obtain resolved images of weird interstellar objects to separate them from rocks? Two approaches come to mind. One is to deploy numerous cameras in advance within the orbit of the Earth around the Sun so that one of them will be close enough to the path of an interstellar object of interest. Another strategy is to launch a dedicated spacecraft equipped with a camera as soon as LSST identifies a weird interstellar object on its approach towards us.

It is often said that "a picture is worth a thousand words". In my case, "a picture is worth sixty-six thousand words", the number of words in my book, Extraterrestrial. The desired picture of `Oumuamua could have distinguished between the object being a natural rock or an artificial object manufactured by an extraterrestrial civilization. The many anomalies exhibited by `Oumuamua forced all natural interpretations of it to invoke object types that we have never seen before –all with major drawbacks, like a hydrogen iceberg–which will likely evaporate by absorbing starlight during its journey, a nitrogen iceberg that is unlikely to exist in sufficient abundance, a dust "bunny", a hundred times more rarefied than air -which might not have the material strength to withstand heating to hundreds of degrees by the Sun, or a tidal disruption relic–which would not possess the pancake-like shape inferred for `Oumuamua.

- **Which scientific 'fashion grills' are hindering our acceptance of other life in the universe?**

The signatures of life might be subtle and difficult to detect. But such are the signature of dark matter, whose nature we do not know. Over the past four decades, we have invested hundreds of millions of dollars in the search for specific particles that account for most of the matter in the universe but without success. We also invested 1.1 billion dollars in LIGO before it discovered the first gravitational wave signal from the universe. My point is that we should first invest similar funds in the search for technological signatures of alien civilizations before we argue that there is no "extraordinary evidence" to support the not-so-extraordinary claim that we might not be alone. In my view, extraordinary conservatism leads to extraordinary ignorance.

- **You state that cultural representations of 'the alien' has led to a ridiculisation of the subject and a scientific movement away from the subject. What's your opinion in this regard of UFOlogy?**

In various conversations with reporters leading to the publication of my new book, *Extraterrestrial*, I encountered difficulties getting across one essential aspect of the scientific process. Science relies on reproducibility of results. In order to believe a phenomenon, it must be possible to reproduce it as an outcome of similar circumstances. Stories about one-time miracles are the foundation of myths and could be believed by the public, but they do not stand up to the standards of science.

According to the biblical story of the binding of Isaac, Abraham heard the voice of God asking him to sacrifice his only son. Today, with a voice memo app on his cell phone, Abraham could have recorded the voice of God and convinced all of humanity to believe in the reality of his experience. But without a recording device, a hearsay evidence is not scientifically sufficient.

Even when scientific recording devices are used, one-time events like the "Wow!" or BLC1 radio signals, are of dubious scientific value because they cannot be distinguished from environmental noise or instrumental malfunction.

The situation gets more complicated with eyewitness testimonies of one-time events. Recently, the Pentagon was asked by lawmakers to disclose all it knows about Unidentified Flying Objects (UFOs) by mid-2021. But this focus on past eyewitness reports is misguided. It would be prudent to progress forward with our finest instruments, rather than examine past reports. Instead of declassifying documents that reflect decades-old technologies used by witnesses with no scientific expertise, it would be far better to deploy state-of-the-art recording devices, such as camera or audio sensors, at the sites where the reports came from, and search for unusual signals. A scientific expedition focused on reproducing old reports would be more valuable to unraveling the mysteries behind them. A conversation I had recently with Joe Rogan about my new book triggered a grassroots initiative to fund such experiments.

My long-term collaborator and friend from Princeton University, Ed Turner, noted that the number of cameras around the world increased by several orders of magnitude over the last couple of decades. They include security cameras, phone cameras, car cameras, drone cameras, dedicated astronomical observatories, and arrays of cameras installed on satellites and aircrafts. This led to a vast increase in the numbers of images, often videos, of car and aircraft crashes, meteors, natural disasters, crimes and so on. A vivid example is provided by the many clear video and sound recordings of the superbolide Chelyabinsk meteor event over Russia in 2013, obtained by different types of cameras from different directions. At the same time, there had been no noticeable increase in the rate at which UFOs are recorded or in the quality of the recordings. "We had fuzzy, intriguing but not compelling, images and occasional videos way back in the 1960s at a time when no one had ever photographed a commercial airplane crash", points out Ed, "but we don't have much better evidence now".

Altogether, assembly of reproducible results by instruments is essential for separating the subjective impressions of humans from objective data gathering. This does not imply that Abraham did not witness the voice of God. Instead, it highlights the need for him to have had a voice recorder in making the biblical report convincing beyond a reasonable scientific doubt.

- **On the one hand you are enthusiastic about the capability of children to think out of the box, on the other hand you are blaming science fiction for ridiculous scenarios. Why?**

  I do not enjoy science fiction storylines that violate the laws of physics. Children often speak naively because of lack of knowledge. They eventually learn and correct themselves. But science fiction writers often deviate knowingly from a realistic storyline that follows the laws of physics. And this I cannot tolerate. We all started as kids. Early on, we put skin in the process of learning out of curiosity.

- **Why is it wise to attach far reaching hypothesis to an anomaly we know almost nothing about? Why not leave it at that: an anomaly and study further? Aren't you using an unknown to explain another unknown? Why not simply say: 'We don't know'?**

Anomalies must have an explanation because they are part of reality. We gain new knowledge by paying attention to anomalies. If we would ignore anomalies, we would never expand our knowledge base. We must allow ourselves to move out of our comfort zone. Quantum Mechanics took many physicists, like Albert Einstein, out of their comfort zone when it showed anomalies compared to classical physics a century ago. But it is the foundation of many of the technologies we use today. And as the two of us communicate via the internet, we should be grateful that the physicists did not ignore the quantum anomalies a century ago.

- **Based on the laws of nature: how would you expect an alien race would look like?**

  It would be shocking, nothing like we have seen before. Most stars are smaller than the Sun and emit infrared radiation and not visible light. I asked students in my class a couple of weeks ago to find an animal on Earth that has infrared vision. One student showed a picture of a shrimp. Its eyes looked like ping-pong balls attached by cords to its head. Definitely as strange as we might imagine an alien to look like.

- **Is there in your opinion and as far as you can judge any possible evidence of alien life right here on earth or in our solar system?**

  No.

- **In a way you are (besides being a modern day Galileo Galilei) an 'intellectual child' of Charles Fort, an American writer and researcher who specialized in anomalous phenomena during the beginning of the twentieth century. Or of dr. Allen Hynek or astronomer Jacques Vallee (both ufologists). Are you familiar with them and if so, any thoughts/feelings?**

  I do what I do based on my inner compass. Any resemblance to others is coincidental.

- **Humans can only know who they are in relation to one another. Can humanity only truly know itself – and thereby make sound decisions for its own wellbeing – by making contact with alien lifeforms?**

  A contact with an advanced alien civilization will transform us more than teach us about ourselves. Discovering advanced technologies may give us a leap into our future and save millions or billions of years of our own technological development. I strongly believe that any such contact would move us out of our primitive and naïve perspective into a grander sense of reality. Just as the psychological shock that my daughters encountered on their first day at the kindergarten.

- **Could the reasons of our life be the evolution of that same life, in other words: to avoid eventually the risks of the Great Filter? To pass that great barrier and evolve on? How could our individual lives be interwoven in such a grand scheme?**

My hope is that by finding dead civilizations that perished by destroying their planet or going to wars, we will get our act together and avoid a similar fate. It is up to us whether we learn important lessons about our future by looking at the sky. We can choose not to look up and end like many of these dead civilizations.

Photos:

Two sets of photos are available at (with credit to Lotem Loeb):

https://lweb.cfa.harvard.edu/~loeb/Photos/LD.html

https://lweb.cfa.harvard.edu/~loeb/Photos/LL.html

Another photo (with credit to Olivia Falcigno) is available at:

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