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Factors affecting the immediate and long-term societal and cultural ramifications of discovering extraterrestrial life

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Abstract

I will discuss some of the factors likely to affect the public response, and the general societal implications of the discovery of life beyond the Earth, both in the short and long-term.

Introduction

Astrobiology is the field of science engaged in understanding the origins and limits of life on Earth, and the possibility of life on other planets. The field is deeply interdisciplinary, involving geologists studying the earliest signs of terrestrial life, biochemists piecing together our cellular workings and origins, microbiologists investigating the hardiest forms of life surviving in environments analogous to those on other planets and moons, engineers and roboticists building capable probes to explore the solar system, and astronomers discovering increasingly Earth-like planets orbiting other stars in the galaxy [1].

Astrobiology has enjoyed a boon over the past decade or two, spurred on by advances in these contributing fields. Although we have not yet discovered unambiguous evidence of biology on another world, many scientists are increasingly optimistic that we may discover convincing signs of extraterrestrial life within our lifetimes.

What might be the likely immediate public response and longer-term social ramifications of just such a discovery?

Key factors

The cultural response is likely to depend on a number of factors, which will be explored in the talk:

(i) the status of the life - is it still active, or have only ancient biosignatures been found

For example, the harsh environmental conditions on Mars today mean that any life near the surface (which is the regions we will be able to access in the near future) is likely to be long-since extinct. The cultural impact of such a discovery may perhaps be relatively subdued, as we will not have found life still alive, but only the fossil remnants left behind by ancient organisms. On the other hand, the liquid water ocean beneath the icy face of Europa may harbour a marine ecosystem still active today and the implications for this, even though exploration of Europa is technologically much harder than that of Mars, may be much greater.

Indeed, both the scientific rewards and cultural ramifications will be much greater if martian cells are recovered preserved, perhaps in permafrost ice, that are dormant but still viable. This scenario offers the prospect of culturing and studying the extraterrestrial cells alive. So much more understanding can be derived from studying fish alive in an aquarium than from fossilised skeletons in a natural history museum, and the same would be true of extraterrestrial microbial life.

Being able to 'look under the hood' of a martian cell to see how it works on a biochemical level would allow us for the very first time to perform 'comparative biology'. This would be analogous to the way that anthropologists comparing different societies are afforded insights into our own. We could see ways that martian cells is similar to our own - perhaps using the same DNA code - but perhaps even more intriguingly, ways that the extraterrestrial life is different from us; truly _alien.

(ii) is it nearby or remote - discovery life on our neighbouring planet, Mars, is likely for a number of reasons to be more significant than evidence for life on an extrasolar planet hundreds of light years away

After the initial detection of Earth-like planets in habitable orbits around their star, the follow-up step will be to characterise them. This can be accomplished by spectroscopic analysis of light coming from the planet, and isolated from the much brighter star light, to read the chemistry of the planetary atmosphere. Detecting a mixture of oxygen and methane in the air is thought to be a reliable signature of biological activity on the planet - revealing that the world is not just habitable but actually inhabited. And in contest to Mars, which may have refugial life deep underground but is apparently dead on the surface, such a conspicuous sign of biology would indicate a globe-spanning ecosystem like the Earth's. This realisation would potentially be one of the most important discoveries in history. But it could also be the most frustrating: you could point up to the location of that oasis of life in the night sky, but not be able to do anything more about it. It would take centuries, if not millennia, for a probe launched from Earth to reach the nearest star systems to investigate these alien ecosystems close-up. In terms of the social implications, discovering not just one apparently life-bearing planet but dozens in our galactic neighbourhood would be even more significant, as it would indicate that life is in fact commonplace, and not confined to a few isolated locales.

(iii) is it simple or complex

The detection of primitive microscopic life on Mars, even if it recovered in a viable state, is likely to have less lasting impact than, say, the discovery of complex animal, and possibly even intelligent, life on another world.

Summary

There is a growing expectation that with the current level of technological capability it is our generation that will make the discovery of life beyond the Earth, and realise that we are not alone in the cosmos. This talk is intended as a starting point for a round-table discussion on what the immediate and long-term societal and cultural implications of such a revolutionary discovery might be.

References

[1] L.R. Dartnell. Life in the Universe: A Beginner's Guide, OneWorld Publications, Oxford, 2007