

**ASTRONOMY BEHIND THE HEADLINES**  
A podcast for Informal Science Educators  
from the Astronomical Society of the Pacific  
[www.astrosociety.org/abh](http://www.astrosociety.org/abh)



**Episode 1: ASTROBIOLOGY**  
with guest **Dr. Chris McKay** from NASA Ames Research Center

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**Narrator:** Welcome to Astronomy Behind the Headlines, a podcast from the Astronomical Society of the Pacific.

In this episode, we're going to talk about astrobiology and the search for life in the universe.

Planet Earth has a complex web of life that manages to survive in some very interesting environments—places that we wouldn't ordinarily expect to be comfortable for living things – like hot springs, or near underwater volcanoes, or hidden beneath the Antarctic ice pack, or even inside rocks.

Could life exist in those same kinds of places on other planets? When we look for signs of life on other worlds, what would we look for?

How do we search it out? And, how would we know if what we find is caused by living things — or some other physical process?

These are all questions that the science of astrobiology tries to answer. Astrobiology is the study of the origin, evolution, and distribution of life in the universe. It looks at where life IS, where it might have existed in the past, and where it could arise in the future.

Astrobiology is an important tool in the search for life – and the conditions that support it – not just in our own solar system, but also on planets around other stars.

In our own solar system, Mars is one of the most obvious places where astrobiologists search for life. Starting with the Viking landers in the 1970s, through the more recent rovers, landers, and mapper missions, scientists have been studying the Mars environment to find out whether it could support living things — or if it ever has.

The result is a good news/bad news scenario. The good news is that Mars has had water in the past. In fact, it has water now, although mostly in frozen form. The bad news is that, so far as we know right now, there is no evidence that life exists on Mars. We've found no fossils of ancient Mars life yet, and if it did exist, it may have been limited to microbes. So, the search for past Mars inhabitants could well be a search for the remains of very tiny organisms.

What would those remains look like? We asked Dr. Chris McKay, a planetary scientist at the NASA Ames Research Center in California.

Chris, what are we searching for on Mars that would tell us if life ever existed there — or if it exists now?

**CHRIS McKay:** *Well, the evidence that's interesting about Mars is that it had water early in its history, and that's what makes us optimistic that it may have had a separate origin of life — separate and independent of Earth life.*

*To my mind, that's what we're looking for on Mars. We're looking for a second genesis. And what this means that it is not enough to just find life on Mars.*

*We have to show that that the life that we find there is different from Earth life. And, showing this isn't easy. Fossils, which is what people often talk about as a target for a search for life on Mars can't be used to determine if Martian life was the same as Earth life. A fossil is just a form of life, it's not an actual organism.*

*To demonstrate that life on Mars is different from life on Earth requires that we actually have the biological remains of a Martian organism. I think the best place to search for such remains is in the ancient frozen terrain near the polar caps. So, an analogy is frozen mammoths in Siberia on Earth, where we find ancient organisms — in this case, mammoths — frozen in the ice. The same idea on Mars — just much, much older and much, much smaller.*

**Narrator:** Based on our experience in the search for life on Mars, what can we carry forward as we look for habitable planets and life elsewhere?

**CHRIS:** *Well, looking at the Earth and looking at Mars, we realize that liquid water is the key environmental requirement for life. And, hence the notion of “follow the water.” So, when we look at planets around other stars we’re interested in is planets with surface temperatures in the range to allow liquid water.*

*But, there’s another point that we learn by comparing Earth and Mars I think that’s equally important. And that is that Earth kept its water and Mars did not. The difference is due to size. Earth is almost 10 times bigger than Mars, more massive — and yes, folks, size matters. This means that when we look at other planets we want to determine not just that their surface temperatures are suitable for liquid water, but also that their size is suitable to maintain the sort of activities — plate tectonics, volcanism, and magnetic fields — that maintain the habitability of the planet . And, we think a planet must be at least half the size of earth to keep its liquid water over geological time. Mars is too small, Earth’s fine, something maybe half the size of the Earth would be all right.*

**Narrator:** Astronomers have been finding planets around other stars since the late 20th century. Eventually, they’ll develop tools to detect the presence of life on these exoplanets — if it exists.

Today, the Kepler mission is searching for Earth-like planets that live in the habitable zones near their stars. These worlds could well have environments with liquid water, where life might possibly exist. They will help astrobiologists understand the many factors that influence the origin and evolution of life, and where it can survive and flourish.

You’ll find more information about astrobiology and the search for life on other worlds at the Astronomical Society of the Pacific’s Astronomy from the Ground Up website. Surf on over to [www.astrosociety.org/abh](http://www.astrosociety.org/abh). Thanks for listening!