

# Planet of the Apes: Curiosity about the definition of life

August 13 2012, By Faye Flam

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After a triumphant landing, the Curiosity rover is ready to search Mars for signs of past life or suitability for life. Several readers have raised concerns that NASA scientists might fail to recognize life if it isn't based on carbon or is otherwise radically different from our kind of life.

It's true that [biologists](#) don't have a single agreed upon definition of [life](#), and often end up with a laundry list of characteristics instead.

That's been a concern for [NASA](#), and so in the 1990s, the [space agency](#) convened a panel to try to define life, said Steve Benner, a biologist from the Foundation for Applied [Molecular Evolution](#) (Ffame). The panel put evolution front and center: Life, the panel decided, is self-sustaining chemical system capable of [Darwinian evolution](#). Benner said [Carl Sagan](#) had some pull on the panel. "This definition is very Saganesque."

Creationists aren't too happy with this, but biologists for the most part say it's a reasonable guess as to what would tie together life through the cosmos.

It's something of a guess because we only have one example of life. All life here on Earth is related, and all organisms share same system of carbon-based molecules - DNA and RNA - to carry assembly instructions and other key information.

It's not hard to image that some other type of life might use an alternative system. In recent years scientists have synthesized alternative

molecules that act like DNA. There's TNA, PNA, and FNA, for example, and while DNA uses a four-character code, scientists have made alternatives that use more. (In the movie ET, the alien had a six-character [genetic code](#)).

Asking earthlings to define life is a little like asking a group born and raised on a deserted island to define animals when they've never seen another animal. How would they know what's possible?

Some creationists worry that the NASA panel's definition will force scientists to ignore or cover up findings of life forms that didn't evolve. Take the creationist website, "Uncommon Descent," which accused me of "getting it wrong" in a previous column for mentioning NASA's Darwinian definition without saying it's controversial because a post-doc at Michigan State University criticized it in a blog post.

The blogging post-doc post in question proposed a "thought" experiment: "Suppose we go to another planet and find one being there, looking exactly like a human being. Everything we can measure about this being confirms that it is just as much alive as you and me. It eats, moves, heals, replenishes, communicates, feels, defecates. Learning more about this being, though, we find that it has no ancestors, and that it does not age. It does not reproduce, and it is the only such being on the planet. Thus, there is no lineage of descent and no population that can evolve. So this being is then not alive? Of course it is. This definition does not work."

Ffame's Benner said this type of criticism rests on a semantic misunderstanding between life and being alive.

One isolated person isn't capable of Darwinian evolution - we can't reproduce without a partner. We're alive but we're part of a larger system that would be considered life.

NASA's Darwinian definition does indeed embody the theory of evolution, he said. And if the theory applies universally, it predicts that you won't find parentless humanoid beings popping into existence.

While NASA needs to think broadly about life, they can't very well go around declaring clouds and flames and crystals alive. One critical distinction, said Benner, is that living things copy themselves imperfectly and pass on the flaws to the next generation. Crystals grow and reproduce themselves with flaws, but the flaws aren't passed down to offspring. They don't evolve.

In looking for signs of past life, a general definition of life is not as important as a set of search criteria, said Harvard biologist Andrew Knoll.

Whether looking for signs of past life on Mars or ancient rocks here Earth, scientists look for patterns that can't be explained by physics and chemistry alone, he said.

Scientists used search criteria, for example, when evaluating alleged fossils in a Martian meteorite called ALH84001. Back in the 1990s, scientists found tiny oval-shaped patterns that looked like fossil Martian bacteria. The features did look interesting, said Knoll, but over subsequent months, other scientists found ordinary physical and chemical processes that could explain them without the need for any biology.

There are, said Benner, beings on "Star Trek" that don't fit the Darwinian definition of life. Q isn't a chemical system, and the Crystalline Entity didn't have parents. In the unlikely event that we find such beings on Mars, "We'll have to change our [definition](#)."

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