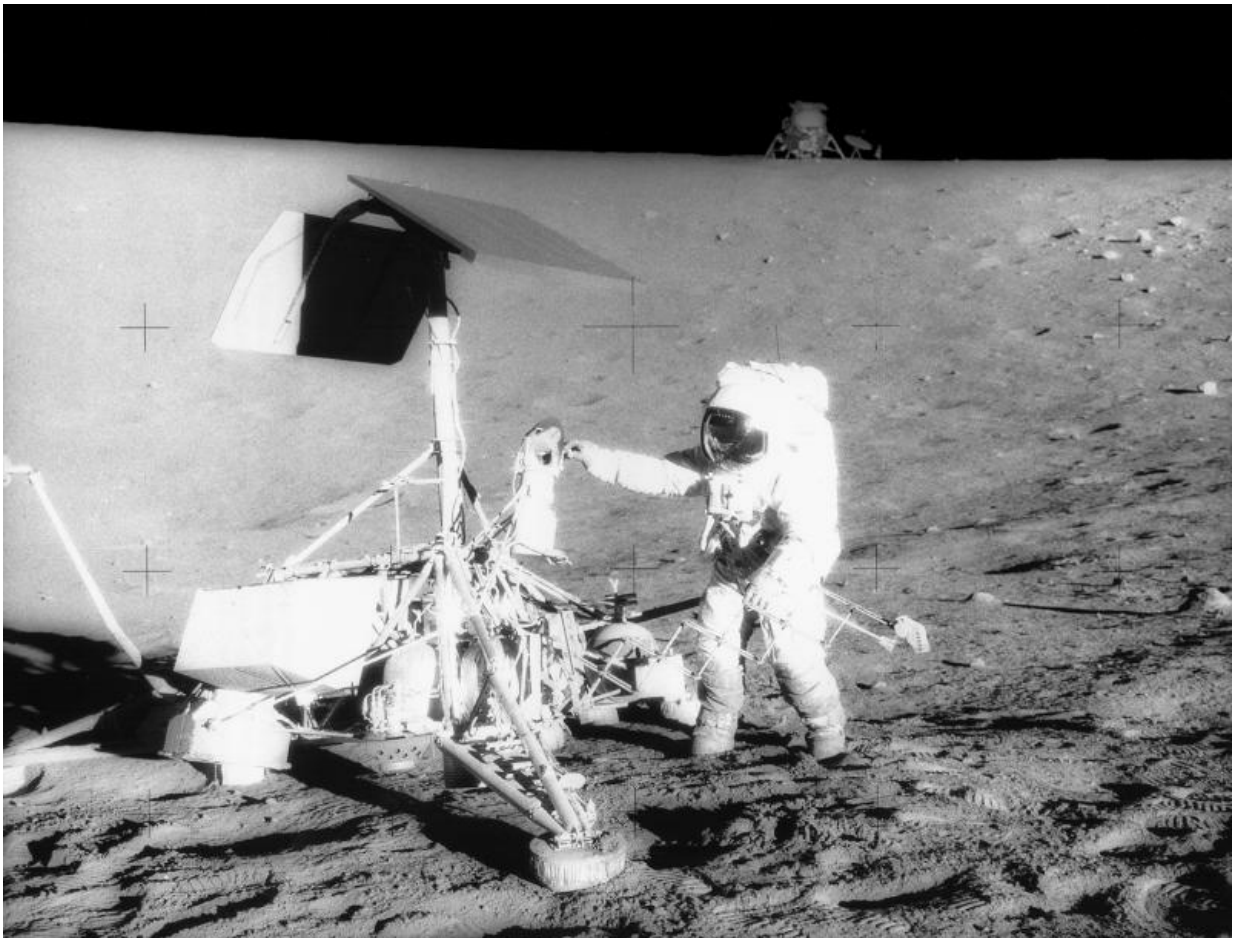


Microbes can survive in meteorites if shielded from UV radiation, study says

May 29 2015, by Elizabeth Howell, Astrobiology Magazine



Microbes were found on a spacecraft called Surveyor 3, which was on the moon for 2.5 years when Apollo 12 took samples back to Earth. The result, however, could have come from post-mission contamination in the lab. Credit: NASA

Outer space might be the toughest environment for life, but some hearty microbes have been able to survive in it for surprising amounts of time. How long they can do so and why they are able to withstand the difficulties of space remains a topic of controversy.

Persistent strains of [microbes](#) have been discovered in spacecraft clean rooms. In 2014, [Russian reports emerged of plankton surviving on the exterior of the International Space Station](#), a claim that NASA officials objected to for lack of evidence.

Still, understanding how well microbes can survive in space is of importance when sending out orbiters or landers around bodies that might present the right conditions for life, such as Mars. Scientists want to be careful to avoid contaminating other worlds with life from our own. And microbes' resilience to Outer Space enhances the prospects of panspermia, in which life can be seeded between planets via meteors and other traveling bodies.

This basis formed part of the rationale for a study led by Rocco Mancinelli, a senior research scientist at the Bay Area Environmental Research Institute, a nonprofit space and atmospheric science research group.

"Results from of this study are relevant to understanding the adaptation and evolution of life," Mancinelli wrote in an e-mail to *Astrobiology Magazine*.

His results were published in the January issue of the *International Journal of Astrobiology* in the article, "The effect of the space environment on the survival of *Halorubrum chaoviator* and *Synechococcus* (Nägeli): data from the Space Experiment OSMO on EXPOSE-R."



Microbes survived on the exterior of the International Space Station for nearly two years, if their UV radiation was limited or eliminated. Credit: NASA

Finding the Limits

Part of Mancinelli's research focuses on microbe-environment interactions, specifically looking at the environmental limits in which organisms can live. One of his research interests includes the vacuum of space, which also is subject to extreme [ultraviolet radiation](#) from the Sun, since there is no atmosphere to filter it out.

In his experiment, Manicelli took pure cultures of two salt-loving microbes, *Halorubrum chaoviator* and *Synechococcus n gelli*, from solid

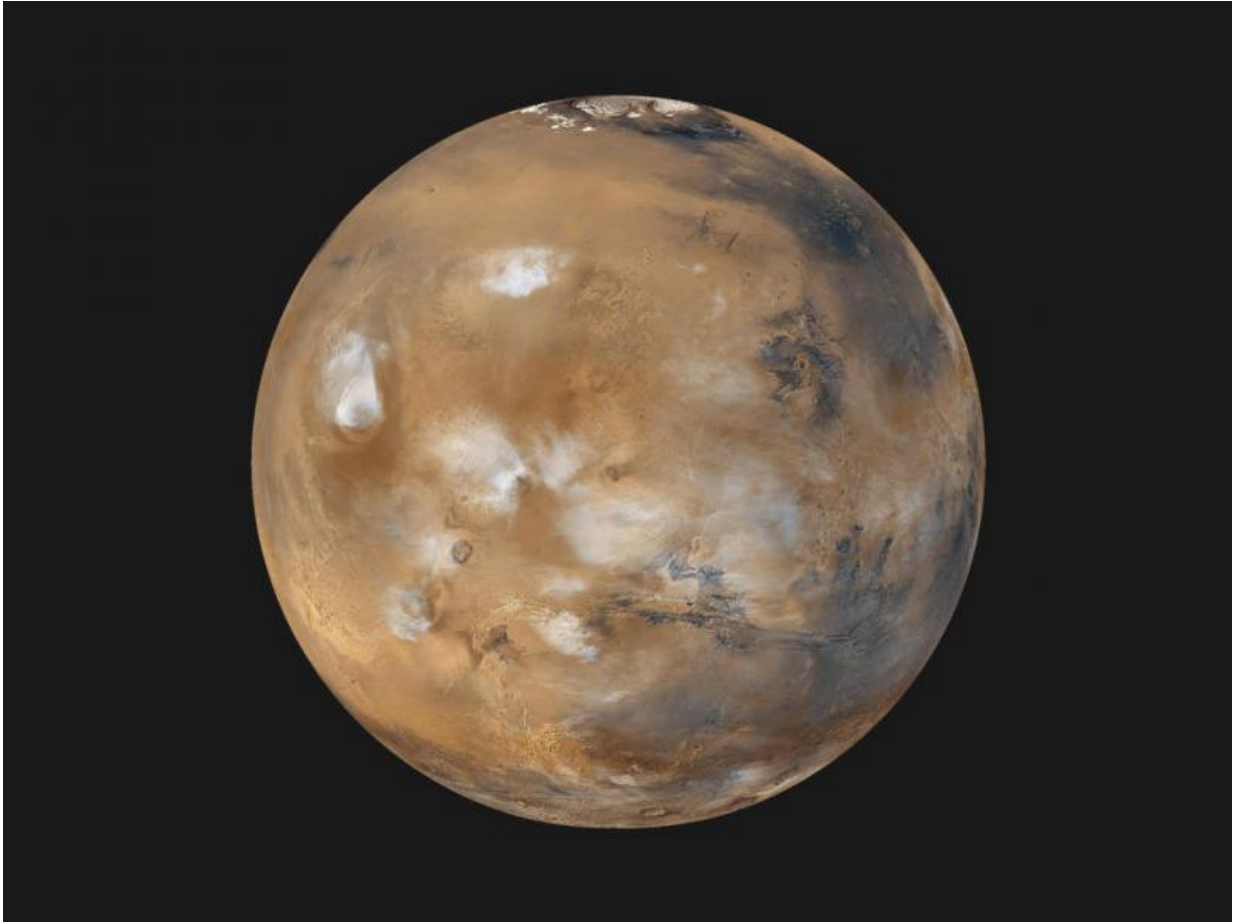
salt crusts and grew them. After drying them, some of the samples were sent to the International Space Station's external platform space exposure facility, called EXPOSE-R. Those microbes remained on the exterior for nearly two years. Other microbes were held back on Earth as control samples.

Surprisingly, some of those in space survived, Mancinelli said.

"Those organisms that were exposed to only the [space](#) vacuum all survived. Those exposed to high doses of ultraviolet radiation died, those exposed to lower doses of UV showed some survival," he said.

One large implication is the possibility that microbes could move around the Solar System, he added.

"In other words, if even somewhat protected from UV, the organisms will survive a journey to another planet or moon in our solar system," he said.



Planetary protection guidelines are supposed to prevent microbes from travelling on spacecraft to Mars, but it's hard to eliminate everything. Credit: NASA/JPL-Caltech/MSSS

What kinds of transfers?

There are numerous examples of planetary pieces from Mars moving over to Earth, specifically in a class of meteorites called SNCs (Shergottites, Nakhilites, Chassignites), which are blasted off the Martian surface during meteorite impacts.

That said, the typical time to move between the planets is millions of

years, making the result "irrelevant" if they were SNCs, Mancinelli said. Microbes could, however, survive in meteorites with a transit time of a few years, providing they are shielded from UV radiation.

More broadly, the experiment is a demonstration of how important it is to keep spacecraft as clean and microbe-free as possible before they leave the lab. NASA, the European Space Agency and other entities have planetary protection guidelines that detail how best to accomplish this, and Manicelli said research in this area must continue.

"We realize that we cannot sterilize spacecraft completely, but we can decrease the bio-load significantly. The relevance here is that we must understand that the probability of potential contamination exists, and that we must reduce that probability as much as possible," he said.

More information: "The effect of the space environment on the survival of *Halorubrum chaoviator* and *Synechococcus* (Nägeli): data from the Space Experiment OSMO on EXPOSE-R." DOI: [dx.doi.org/10.1017/S147355041400055X](https://doi.org/10.1017/S147355041400055X)

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