

## Synthetic biology might aid in Mars mission

Mars is a long way off. About 34 million miles away, depending on planetary orbits. Space agencies planning a mission there have estimated that sending six crew members to the Red Planet would take about 916 days — 210 days for travel there and back and a 496-day stay on the Martian surface.

That's a lot of packing to do. In fact, NASA estimates that for every unit mass of payload launched, an additional 99 units of mass is needed to support the crew. We're talking fuel, oxygen, food, medicine, etc.

But two scientists from Lawrence Berkeley National Laboratory (Berkeley Lab) have put forth an idea in the *Journal of the Royal Society Interface* that could shrink the supporting payload and significantly reduce the cost for such a venture.

They propose using synthetic biological processes to turn crew waste, Martian soil, minerals and gases from the atmosphere into propellants, food, medicine and raw materials for three-dimensional printing.

"Not only does synthetic biology promise to make the travel to extraterrestrial locations more practical and bearable, it could also be transformative once explorers arrive at their destination," Adam Arkin, director of Berkeley Lab's Physical Biosciences Division said in a press release.

Arkin, a leading authority on synthetic and systems biology, published the study with Amor Menzes.

For example, crew members could turn carbon dioxide into methane for fuel. They could use microbes to sustain plant-based farming and produce pharmaceuticals. They could turn minerals into the raw materials for 3-D printing.

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