

NASA wants to save poop on the moon ... for science

Astrobiologists interested in studying bacteria in decades-old astronauts' feces

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Has bacteria in astronaut poop left on the moon been genetically altered? Did solar wind and ultraviolet radiation destroy the flag at Tranquility Base, landing site for the first Apollo moon mission? Are the lunar rovers dented with micrometeoroid impacts?

These are among the science questions raised by a NASA team tasked to come up with guidelines to preserve lunar artifacts before contenders in a \$30-million competition sponsored by Google arrive on the moon beginning in about two years.

About 28 teams are competing to send privately funded robotic spacecraft to photograph and explore the lunar surface. Winners can get bonuses if they visit lunar historic sites, a prospect that got NASA thinking about its property on the moon.

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Six crews landed on lunar surface between 1969 and 1972, leaving behind descent modules, communications antennas, rovers and yes, even bags with feces. The Apollo artifacts are part of a larger collection of relics that also include Soviet-era spacecraft and crashed NASA probes.

"The flag, footprints, the lunar rover ... all is there, and we really don't know exactly what's happened," said Rob Kelso, director of NASA's lunar commercial services program at the Johnson Space Center in Houston.

"In a real sense, the hardware that still sits on the moon are ongoing experiments in scientific witness plates, of looking at environmental impacts over time, which can provide significant engineering data about how systems and structures survive," Kelso said during a presentation last week at the International Symposium for Personal and Commercial Spaceflight in Las Cruces, N.M.

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Astrobiologists, for example, are interested in studying how bacteria in the astronauts' feces have fared after 40 years and if they have undergone gene mutation. Microbes also existed in clothes, food containers and other gear left behind on the moon.

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"The crews put their feces bags, urine bags, food containers, their clothes, in a bag and would jettison that out of the hatch prior to liftoff as they tried to shed as much weight for ascent performance," Kelso said.

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Scientists also are interested in studying the metals in the lunar rover and other gear, which has been subjected to temperatures that regularly and repeatedly cycle between minus-370 degrees and 250 degrees Fahrenheit.

To preserve the artifacts and prevent accidental damages, NASA wants visiting vehicles to keep their distance. The buffer zones vary depending on the particular relic and its historic significance, with the Apollo 11 and Apollo 17 equipment and sites — the first and last human expeditions to the moon — garnering the most restricted access.

The buffers vary between 1 to 3 kilometers (0.62 to 1.2 miles) for each artifact, be it a hammer a drill or a lunar rover. Visiting spacecraft also are advised to descend and land at least 2 kilometers (1.24 miles) away from historic sites to avoid pelting hardware with lunar dust.

The Lunar Heritage Sites recommendations have been provided to the X-Prize Foundation and the Google Lunar X Prize teams, NASA spokesman J.D. Harrington told Discovery News.

With no way to enforce the rules, compliance is voluntary.

"Any future lunar landing vehicle teams can select the level of compliance within their mission design and adopt according to their team plans," Harrington wrote in an email.

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