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PRESERVING OUR PLANET

Colonizing outer space is now science - not fiction

By Catherine Bolgar

The photos flashing back from the Mars rovers now exploring the red planet show there are no little green men running around. But someday, there might be men - of the human kind - on Mars.

Or elsewhere in the solar system. A number of groups are researching ways to colonize outer space. Some are driven by fears that an asteroid or pollution will destroy Earth and mankind. Others see a grand adventure, a new frontier to explore in the spirit of Christopher Columbus. Still others see opportunity in the form of new sources of raw materials to mine when Earth's resources run low.

The European Space Agency commissioned a study of science fiction in order to highlight imaginative ideas that were potentially viable as real-life projects. It's not unreasonable. Some sci-fi predictions that became real include planetary landers (1928); rocket fins for aerodynamic stability (1929); and construction of an orbital space station complete with living quarters using materials ferried up and regular service visits (1945), according to the study's contractors, Maison d'Ailleurs, a science-fiction museum in Yverdon-les-Bains, Switzerland, and the Basel-based OURS Foundation, which promotes a cultural dimension for space exploration.

For some, a space colony is not a pie-in-the-sky fantasy but an earthly business. "It's not if this is going to happen, it's when it's going to happen," says Mark Homnick, chief executive of 4frontiers Corp., a private Florida-based company dedicated to colonizing Mars. The four frontiers of the company's name are Earth, the moon, Mars and its moons and the asteroids. "We believe the emerging solar-system economy will focus on the first three initially, until technology advances to allow asteroid mining," Mr. Homnick says.

"We've laid out a roadmap for all the development work, all the engineering we have today to see what we need to do to get there," says Joseph E. Palaia, vice president of operations and research and development for 4frontiers. The company envisions launching the first cargo to Mars in 2018 and completing construction of a 25,000-square-foot colony for 12 people by 2025.

The company is focusing on Mars because "it has all the resources that we would need, not just to support life but to support industrialized society," Mr. Palaia says. "It has some of the key resources like carbon and nitrogen in abundance. All the key resources we need for maintaining industrialized society."

Some things would have to be imported, such as tools, a temporary habitat and complex machinery such as microprocessors. "They're very difficult to manufacture and very light to transport," Mr. Homnick says.

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"It turns out that a lot of the high-mass items that we would need are very low-tech things to make on Mars. Bricks, glass, fiberglass - all the materials are available on Mars and they're all relatively low-tech to manufacture," Mr. Palaia adds.

Others see the project as more difficult.

"For a short mission, for example to a space station, you transport everything: water, food, oxygen. You don't recycle onboard," explains Dr. Christophe Lasseur, life-support coordinator at the European Space Agency in Noordwijk, the Netherlands. "If you want to go to Mars, this is not possible. The quantity you have to launch is far too big - five kilograms per day per person only for drinking water and food. If you think about washing water, it's much more. Multiply that by a crew of six and by 1,000 days, which is roughly a Mars mission. So that's 30 tons, which is far above the current launcher ability."

So Dr. Lasseur is studying how to recycle everything: oxygen, water, even fecal matter.

The ESA has several projects under way to develop technologies needed for extended stays in space. Systems using physical-chemical processes already are in use on the International Space Station. Melissa - for Micro-Ecological Life Support Alternative - examines microbial degradation of wastes. The ESA is also working with the Antarctic Concordia Station. Antarctica is one of the most isolated and difficult places on Earth and replicates many situations man will find on long space journeys. Under international treaties, all waste materials on Antarctica must be removed. Wastewater, in particular, presents a problem, so ESA helped design the advanced water-recycling methods being used at Concordia. And ESA's Aurora program is developing robot technologies - also tested at Concordia - that could be used in a Mars mission.

The man who really pushed the idea of space colonies was the late Princeton University Prof. Gerard K. O'Neill, who wrote several books on the topic. He explained how colonies could be organized. A design he called "Island Three" puts a colony in a rotating cylinder 20 miles long and four miles across. Inside, six "land" and "sky" panels would alternate along the length of the cylinder. The land panels would have a small city at either end, with shared wilderness between. Bridges would traverse the sky panels, which would have big exterior rotating mirrors to reflect sunlight inside. The rotation of the cylinders would produce a centrifugal force to simulate gravity.

Man's first pied-a-terre in space is likelier to be on the moon. NASA is planning to send astronauts back to the moon before 2020, to build outposts for teams of four astronauts to stay for up to six months. Lessons learned would be used to do the same thing on Mars. Already, NASA engineers are designing the new spacecraft's engines to burn liquid methane, because one day astronauts could convert Mars' resources into fuel for their return trip.

Why go to space? For some, like Messrs. Homnick and Palaia of 4frontiers, it's about adventure and opportunity.

"There's the economic incentive for one thing," says Mr. Homnick. "Other planets could provide natural resources that are being depleted on Earth. Mining in space could help us keep raising our standard of living.

"From a human spirit perspective," he continues, "our world is shrinking, with less and less opportunity for discovery. It's food for the human spirit. Hundreds of years ago, feudal farmers toiled on tiny plots of land, enslaved by their fears of change. One day, people will look back on us now from where they are in space and they will say the same thing."

For others, the race for space is a matter of survival. "To ensure the survival of the human species, which is encountering increased natural, man-made, and extraterrestrial threats, including disease, resource depletion, pollution, urban violence, terrorism, nuclear war, asteroids, and comets," is one of the rationales for the National Space Society, a U.S.-based nonprofit group "dedicated to the creation of a spacefaring civilization."

Whether for optimistic or pessimistic reasons, people remain fascinated by the idea of living in space. Will we see it in our lifetimes?

"A long-term stay on the moon is expected for 2018," says ESA's Dr. Lasseur. "Will we get to Mars in my lifetime? I don't think so. But you never know. Maybe it will happen (TK)."

