

The Virtual Astronaut

Robert Park

When the president delivered his Moon-Mars speech, it was nearly the anniversary of the *Columbia* disaster. Within hours of the shuttle's disintegration, the president went on the air to declare that "our journey into space will go on."

That's what he should have done. The exploration of space is an important endeavor, worthy of great national support. But President Bush's idea of space exploration is misguided.

In his January speech at NASA headquarters, President Bush called for a base on the Moon, which could one day be used to launch a manned expedition to Mars. If that sounds familiar, it should. I was there in 1989 when his father stood on the steps of the Air and Space Museum and set forth exactly the same vision. This president seems forever destined to finish his father's unfinished business.

The current George Bush invoked Lewis and Clark, while his father invoked Columbus. It is worth remembering that halfway across the Atlantic, Columbus had a crisis of confidence in which, fearing mutiny, he locked himself in his cabin. If he had possessed a drone that he could have sent out to discover whether there was something across the ocean besides the edge of the Earth, I'm sure he would have done so. But he didn't. That's a technology we have now. And to talk about Lewis and Clark and Christopher Columbus as models in the twenty-first century is bizarre. The image of explorers facing the unknown dangers of a strange planet a hundred million miles from Earth is certainly heroic, but it's hopelessly old-fashioned. If you want romance, read romance novels.

The great adventure worthy of the twenty-first century is to explore where no human can ever set foot. In the entire history of humanity, we could never do that before. But with modern technology, we can explore places where no human being can ever go. This is the exciting future we have in space exploration.

The president spoke of "human missions to Mars and to worlds beyond." But if we insist on exploring Mars with human beings, that's the end of our journey.

There's no place else to go. In our solar system, every place else is impossible. In some places the gravity is too great; it would crush a human. In some places, the radiation levels are too high or the temperatures are too high. Mars is just about it. It is, in the end, a very limited journey. We're going to launch an exploration of the universe that can only go to Mars?

Ironically, when the president made this speech, we already *were* on Mars. We're there now. We have two rovers that are mere extensions of the scientists back on Earth. And it's the scientists that operate the rovers. I hesitate to call them robots; they're telerobots. They extend the scientist's senses to a place where it's inconvenient for him to go.

In large part, we judge the success of a civilization by the extent to which dangerous or menial tasks are done by machines. And space travel is both menial and dangerous. It is dangerous for obvious reasons, and menial because humans don't really fly the ship: the robots fly the ship. The humans are just expensive passengers—terribly expensive. The cost of doing anything in space with human beings is vastly greater than doing it with robots.

And it's not clear that the robots don't do it better. The robots that are on Mars right now, Spirit and Opportunity, are only second generation machines. The first generation was Sojourner seven years ago. Future generations will be even more advanced and more capable.

Scientists back on Earth see Mars through the rovers' eyes. And the rovers have better eyes than any human. They can focus on nearby things like grains of sand and distant things like mountains. They can see microscopically or telescopically. We can't do that.

In fact, if a human were on Mars, what could he do? I have been on field trips with geologists. They use their hands. You don't have those hands when you're locked in a space suit. You can't pick up a rock and heft it, you don't get any feel of its composition, any sense of hardness or texture. You would have no sense of touch. There's no sense of smell. There's nothing much to hear on Mars, except maybe a very low rumble from the wind. So the only sense an astronaut would have is the sense of sight, and even that's through a visor. The robot's sight is simply much better.

Simply put, the future is not in spacesuits. The future is in robots. Our robots get better every day. Human beings haven't changed in 35,000 years.

Beyond the scientific advantages, robotic exploration is more democratic. It's as though we're all there. I can go every day to NASA's websites to look at the latest pictures, sometimes live pictures. Some years ago, when we were doing a flyby of Neptune, I took my class out to NASA's Goddard Space Flight Center and we watched the image of Neptune being built up one line at a time on the huge screen. When I looked at my students, they were doing the same thing I

did when Neil Armstrong stepped on the Moon. They were holding their breath; they were excited. The same is true with today's rovers: we feel like we're going along on the mission.

One flawed justification for sending humans into space is the promise of scientific or technological "spin-offs." In my experience, there are three kinds of liars—ordinary liars, damned liars, and spin-off claimers. Of course, when you spend billions of dollars on a human spaceflight program, you're going to get some spin-offs. And a great many of the spin-offs supposedly developed by NASA were actually developed quite independently by private industry, which used NASA as good advertising. NASA loved it, because they could tout these achievements in front of Congress and look like they were doing something useful.

But in reality, the most impressive spin-offs—communication satellites, spy satellites, weather satellites, and global positioning systems—have all been products of the *unmanned* space program.

The best science is also usually national science. The Clinton administration's rationale for the International Space Station celebrated the benefits of international cooperation: the idea that science would improve by working together with other nations, and that working together on science would improve the relations among nations. This is a bogus rationale for going to space—and ultimately ineffective. The reason internationalizing science doesn't work is that Congress—and it works pretty much the same way in other countries—prefers research conducted for the improvement of the United States. Congress doesn't understand or like the argument that research is for the improvement of the world, and they never will. They are always going to vote on a closer conception of the national interest.

Some people have more wild notions for sending humans into space—like putting colonies on Mars or terraforming Mars. But why have we had colonies in the past? Put bluntly, to rape a region of the Earth and bring its riches back to the home country. But what are the riches on Mars? I'm at a loss to know just what we could bring back that would begin to compensate for the cost of going to get it.

As far as terraforming goes—we are unable to maintain our atmosphere on Earth the way it should be maintained. Do we really believe that we can build a new atmosphere on a planet that doesn't have one?

If we are serious about the exploration of space, we should stop this dangerous and expensive project of sending human beings. At most, we should preserve some manned spaceflight capability in case a situation arises where we really need to send up a human being—although I cannot for the life of me imagine what such a situation would be.

We certainly shouldn't send humans to explore Mars. The reason we're most interested in visiting Mars is to find out whether life exists beyond Earth and, if

so, how common life is in the larger universe. That's what we long to know, and that's why those robots are up there right now: they're looking for evidence of liquid water on Mars, since evolutionary biologists believe that if there is liquid water for long periods of time, there is a strong likelihood of life.

My nightmare is that we send humans to Mars to look for life, because we're going to find it—but it's going to look awfully familiar if we contaminate the planet. We will end up bringing Earth life to Mars rather than finding Martian life there. There are more bacteria in one human gut than all the people that have ever lived on Earth. One accident on Mars with a human being and the search for life is pretty much over.

We don't need to send life to look for life. We should be sending out sterilized spacecraft and sterilized robots. Fortunately, our machines get pretty well sterilized just by being out there, just by making the trip to Mars. But the one thing you can't sterilize is a human being.

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