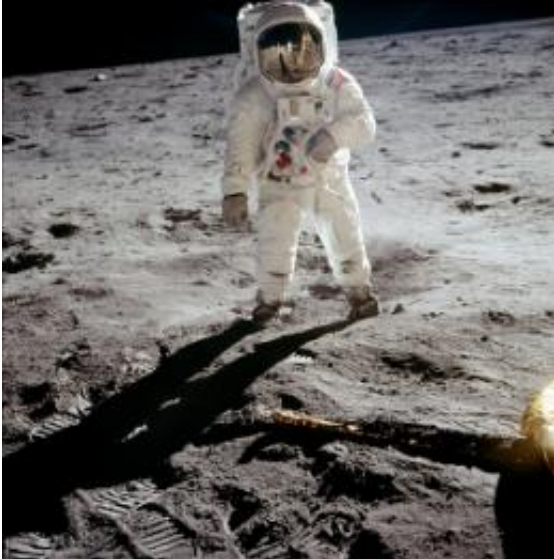


Cyborgs needed to save species

September 16 2010, By Anuradha K. Herath



In the history of the space program, humans haven't spent too much time in space. Before colonization can become an option, more studies are needed about how the space environment will affect human biology. Credit: NASA

As the growing global population continues to increase the burden on the Earth's natural resources, some historians and scientists think humans should prepare to colonize space. The problem is, we may have to alter human biology significantly to achieve that goal.

Scientists have warned for decades that humans are straining the Earth. The [global population](#) is increasing, economies are expanding and consumption doesn't appear to be slowing.

While save-the-planet campaigns are asking people to save energy, conserve water, recycle and even go vegetarian, some scientists are thinking literally out of this world by suggesting that humans may eventually have to consider leaving Earth if they are to survive as a species.

In the September issue of *Endeavour*, senior curator at the Smithsonian National Air and [Space](#) Museum Roger Launius takes a look at the historical debate surrounding human colonization of the solar system and how human biology will have to adapt to such extreme space environments.

Colonizing the Solar System

Experiments have shown that certain life forms can survive in space. Recently, British scientists found that bacteria living on rocks taken from Britain's Beer village were able to survive 553 days in space, on the exterior of the [International Space Station](#) (ISS). The microbes returned to Earth alive, proving they could withstand the [harsh environment](#).

Humans, on the other hand, are unable to survive beyond about a minute and a half in space without significant technological assistance. Other than some quick trips to the moon and the ISS, astronauts haven't spent too much time too far away from Earth. Scientists don't know enough yet about the dangers of long-distance space travel on human biological systems. A one-way trip to Mars, for example, would take approximately six months. That means astronauts will be in deep space for more than a year with potentially life-threatening consequences.

“If it's about exploration, we're doing that very effectively with robots,” Launius said. “If it's about humans going somewhere, then I think the only purpose for it is to get off this planet and become a multi-planetary species.”

Launius isn't the only person who envisions humans leaving Earth. Acclaimed British physicist Stephen Hawking recently discussed his own thoughts on how the human race would survive.

"I believe that the long-term future of the human race must be in space," Hawking told the Big Think website in August. "It will be difficult enough to avoid disaster on planet Earth in the next hundred years, let alone the next thousand, or million. The human race shouldn't have all its eggs in one basket, or on one planet."

If humans are to colonize other planets, Launius said it could well require the "next state of human evolution" to create a separate human presence where families will live and die on that planet. In other words, it wouldn't really be *Homo sapien sapiens* that would be living in the colonies, it could be cyborgs—a living organism with a mixture of organic and electromechanical parts—or in simpler terms, part human, part machine.

To Be a Cyborg

By definition, cyborgs are not a thing of the future, but very much a thing of the present. Launius classifies himself as a cyborg because he relies on medical technology to sustain and enhance his life.

"There are cyborgs walking about us," Launius said. "There are individuals who have been technologically enhanced with things such as pacemakers and cochlea ear implants that allow those people to have fuller lives. I would not be alive without technological advances."



The image shows an artist's rendition of a future base on Mars. A manned-Mars mission would take require astronauts being in space for more than a year. Currently, there isn't enough research to know what long-term deep space travel would do to astronaut health. Credit: John J. Olson

The possibility of using cyborgs for space travel has been the subject of research for at least half a century. An influential article published in 1960 by Manfred Clynes and Nathan Kline titled "Cyborgs and Space" changed the debate. According to them, there was a better alternative to recreating the Earth's environment in space, the predominant thinking during that time. The two scientists compared that approach to "a fish taking a small quantity of water along with him to live on land." They felt that humans should be willing to partially adapt to the environment to which they would be traveling.

"Altering man's bodily functions to meet the requirements of extraterrestrial environments would be more logical than providing an earthly environment for him in space," Clynes and Kline wrote.

Even though it may be both logically and technologically possible, the ethical question is whether it should be done.

“It does raise profound ethical, moral and perhaps even religious questions that haven't been seriously addressed,” Launius said. “We have a ways to go before that happens.”

Grant Gillett, a professor of medical ethics at the Otago Bioethics Center of the University of Otago Medical School in New Zealand said addressing the ethical issue is really about justifying the need for such an approach, the need for altering humans so significantly that they end up not entirely human in the end.

“(Whether we) should do it largely depends on if it's important enough for humanity in general,” Gillett said. “To some extent, that's the justification.”

The greater concern, according to Gillett, is that the cyborgs will likely only have a simulation of human behavior. What is important, he said, is not what the cyborgs are made up of but what types of moral sensibilities and intuitions are built in. And there is really no way of knowing for sure or even of making reasonable guesses without doing a lot more work on the moral nature of humans.

“I think the danger is that we might end up producing a psychopath because we don't quite understand the nature of cyborgs,” Gillett said.

The Future of Cyborgs



NASA has used robotics effectively in space exploration. Medical ethicist Grant Gillett says the need to colonize space would require a greater justification.
Credit: NASA Ames Research Center

At first, as Launius points out in his article, NASA did support this field of research, but that interest lasted for less than a decade. By the late 1960s, the agency had distanced itself from the topic. For one, the technology was not available at that time. However, some scientists think the problem was more about public image. Would the American public of that decade—one that was arguably obsessed with the space program and idolized astronauts—have accepted the “cyborgization of (the) astronaut corps”?

NASA still isn't focusing much research on how to improve human biological systems for space exploration. Instead, its Human Research Program is focused on risk reduction: risks of fatigue, inadequate nutrition, health problems and radiation.

While financial and ethical concerns may have held back cyborg research, Launius believes that society may have to engage in the cyborg debate again when space programs get closer to launching long-term deep space exploration missions.

“If our objective is to become space-faring people, it's probably going to force you to reconsider how to reengineer humans,” Launius said.

Source: Astrobio.net, By Anuradha K. Herath

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