

Scientists are considering the possibility of sending humans to Mars in the coming decades. Although there have been successful manned missions to the Moon in the 1960s and 1970s, Mars is 150 times further away from Earth than the Moon is. Thus the project of sending humans to Mars would require solving an array of problems the Moon missions did not have to face.

One problem is that a round-trip to Mars and back is likely to take at least two years. The trip to the Moon lasted only a few days, and it was easy to bring enough supplies of food, water, and oxygen; but the cargo capacity of space vehicles is too limited to put on board the food, water, and oxygen required by a crew for a period of two years. Without those essentials, though, a Mars mission is impossible.

A second problem is that astronauts on the Mars mission would be in the zero-gravity environment of space for many months at a time. Spending a long time in the zero-gravity environment has negative effects on the human body, such as decreased muscle mass and lower bone density. Over the course of a two-year mission, the effects would be so severe, they would make it impossible for humans to make the trip without experiencing grave medical problems.

Finally, astronauts on a mission to Mars would be exposed to dangerous levels of space radiation, much of which comes in the form of charged particles emitted by the Sun. Earth's magnetic field, which normally protects us from dangerous solar radiation, would not be able to protect a spaceship traveling in interplanetary space. Constructing a shield that would protect the whole spaceship from space radiation is at present impossible because it would add too much weight to the ship.

Now listen to part of a lecture on the topic you just read about. A trip to Mars will definitely be challenging, but scientists have proposed solutions to the problems the reading selection discusses. First of all, food, water, and oxygen. Well, astronauts can use hydroponics. Hydroponics is a technique for growing plants with their roots in water rather than in soil. It requires relatively little space. Using hydroponics, the astronauts should be able to cultivate food crops in the spacecraft. In addition, the hydroponically grown plants will recycle wastewater and release it as clean water vapor, which can be collected as drinking water. And of course, all plants absorb carbon dioxide and release oxygen, so thanks to hydroponics, the astronauts will also have fresh air to breathe. Second, the effects of zero gravity. Over the last few decades, we have launched several space stations orbiting the Earth, and a number of astronauts have spent many months on them in a zero-gravity environment. These astronauts have learned to use several techniques to safely manage the effects of zero gravity. For example, regular exercise prevents the decrease in muscle mass. Likewise, taking vitamins and minerals like calcium slows down the decrease in the astronauts' bone

density. Third, solar radiation. Astronauts traveling to Mars will be exposed to some solar radiation, but this radiation will not be at dangerous levels all the time. The Sun only releases dangerous amounts of radiation occasionally, during periods when it's particularly active. In order to avoid this threat, the spacecraft could be equipped with special instruments that monitor solar radiation, and with a small shelter that is shielded against radiation but doesn't add much weight to the ship. Most of the time, the astronauts would go about their normal business in unshielded areas of the spacecraft. But when their instruments detect increased radiation, they could stay in the small shielded area until the danger has passed.

Summarize the points made in the lecture, being sure to explain how they respond to the specific concerns presented in the reading passage.

Do you agree or disagree with the following statement? All university students should be required to take history courses no matter what their field of study is. Use specific reasons and examples to support your answer.