

TRANSCRIPT

LECTURER: Good morning, everybody! Hope you had a productive week. I happened to spend a fantastic long weekend in Chile, at the Millennium Center for Supernova Science. If you ever want to have a vacation abroad—always, always go to Chile. 42% of the world’s telescopes are there, so why would you go anywhere else? Now, to the lecture.

Have you ever imagined living on a different planet? Or of the possibility that one day humanity will inhabit the entire solar system? The idea in itself is not new. Probably half of all the science fiction books ever written have stories that take place on a different planet. Yes, *The Martian Chronicles* by Bradbury. *Dune* by Frank Herbert. *The Word for World is Forest* by Ursula Le Guin. All fascinating reads!

So, can we live on other planets? No. At least not yet. As you just finished reading the chapter on the solar system, you will remember that many characteristics of the known planets make them unsuitable for human habitation. Let’s take a closer look at the planets. The first planet from the sun is Mercury. Temperatures vary from +430 degrees Celsius during the day to -100 degrees at night. Such great fluctuations are a result of Mercury’s proximity to the sun and lack of atmosphere. Venus, on the other hand, has too much atmosphere; it is filled with acidic gases. Atmospheric pressure can be 90 times that of the Earth’s surface. Investigations of Mercury and Venus can only be accomplished by unmanned spacecrafts. Saturn or Jupiter? As you will remember, they are gas giants, with no solid surfaces. Again, unmanned probes collect various data about the planets, but no person can walk there. Literally.

Now, what about Mars, the planet named after the Roman god of war? It has been intriguing artists and scientists for thousands of years. Since 1960 over 70 astronomical missions have attempted to reach Mars. Approximately one-third of these attempts succeeded, which means twice as many failed. The first successful mission was *Mariner 4*. On July 14, 1965, it flew by Mars and sent 21 photographs back to Earth. While the first photographs were being processed by a computer, scientists used drawing tools from a nearby arts store to produce a hand-drawn image of Mars based on the numerical data. Generally, *Mariner 4* was the first big success.

The first successful probes to land on the surface of Mars were *Viking 1* and *Viking 2* in 1975. Both machines worked for years transmitting images and other information back to Earth. Apart from taking pictures and collecting geological data, the landers conducted experiments to look for signs of life on Mars. While they identified some chemical activity on the surface of the planet, no evidence of living microorganisms was found. Since that time, National Aeronautics and Space Administration (NASA), the Soviet Union, India, Japan, and Europe have carried out successful Mars missions. Seven spacecrafts are currently operational—either orbiting the planet or exploring the surface.

Mars is arguably the best candidate for colonization, due to its atmosphere and presence of water. First of all it would take 6–7 months to reach Mars with the best technology we have now, with costs going over 500 billion dollars. The psychological wellbeing of the people aboard is a big concern, as well as the potential contamination of Mars or Earth with unknown materials. Another point under discussion is further exploration of Mars after landing. People will have to build stations, create sustainable living areas, possibly terraform the planet. For those of you who do not read science fiction, terraforming is a process of changing the environment of a planet to make it suitable for human life.

Numerous scientific innovations are being created to make the human journey to Mars possible. Orion is a new capsule designed to facilitate human travel into deep space. As we speak, some astronauts have spent over a year in space, and have even started growing their own lettuce. Another important advancement is the Mars Oxygen Experiment (MOXIE). The mechanism is designed to pull in carbon dioxide from the Martian atmosphere and turn it into breathable air. So, what about sending people to Mars? There are plans to organize manned missions to the Red Planet in the 2030s. Oh, I can see a hand. Is that a question or would you like to volunteer to go to Mars?

STUDENT: Professor Aspiri, are planets the only options? But what about satellites?

LECTURER: Thank you! Very good question! In many respects, satellites—that is, the moons that orbit a planet—are interesting candidates for future human settlement because of their number and variety. There are 19 satellites in the solar system big enough to be round. You will remember that massive objects become round due to their own gravity. It is believed that four major satellites—Europa, Ganymede, Callisto, and Titan—have underground oceans. Titan, Saturn’s moon, is big enough to have its own atmosphere. Asteroids are another alternative. They are generally not large enough to have an atmosphere or enough gravity, but can provide natural resources in the future. Any other questions?