



U.S. Saturn V rocket launched Apollo 11 to the Moon, July 16, 1967



Chinese Chang'e 1 launched a Lunar satellite, October 24, 2007



Indian Chandrayaan-1 launched India's first Moon mission, October 22, 2008

Back to the Moon

There's a new race to the Moon and the U.S. and Russia aren't in the starting blocks.

The world's first space race began way back in 1957. The United States and the Soviet Union were the only competitors. The Soviet Union jumped ahead by launching the first Earth satellite and the first man in space. But the U.S. quickly caught up and went on to be the only nation to land people on the Moon and then led in the development of the International Space Station (ISS). Today, the Soviet Union no longer exists. Russia continues to launch satellites and transport people to the ISS, but its space effort is greatly reduced from its heyday. The U.S. Space Shuttle fleet will stop flying in 2010. A new rocket is planned to fly in 2015. Meanwhile, astronauts will have to fly on Russian rockets to get to the ISS. The old competitors seem tired and weary. But there are a group of new boys on the space block who are lean and mean and ready to go—the Asians.

The Asian Wave of the Future

Throughout the twentieth century, rocketry and space exploration was led by Europe, the United States, and the Soviet Union (now Russia). But in the beginning of the twenty-first century, Asian countries are coming on strong. They are designing their own rockets and launching their own satellites. They are planning their own space stations and they have started exploring the Moon. How and Why?

Space: Not Just for the Few and Powerful

Not all that long ago, space rockets were the stuff of fiction. Jules Verne wrote *From the Earth to the Moon* in 1865. Verne describes how a huge cannon built into the Earth could fire a bullet-like capsule to the Moon. His idea wouldn't work but it inspired the imaginations of many people and more than a few writers.



During World War II, Germany was the first nation to build large rockets for military purposes. After the war, the design of the German V-2 rocket was used by both the United States and Soviet Union to develop their own rockets for the military and space exploration.

In 1975, the European Space Agency (ESA) was formed. Seventeen European countries participate. Canada is a special status member. The Europeans increasingly cooperate with the Russian and Chinese space efforts.

Here Come the Asians

For hundreds of years, most of the countries of Asia suffered under western colonial rule, poverty, and under-development. But in a relatively short time—since World War II—a number of these countries have developed strong capabilities in science and technology.

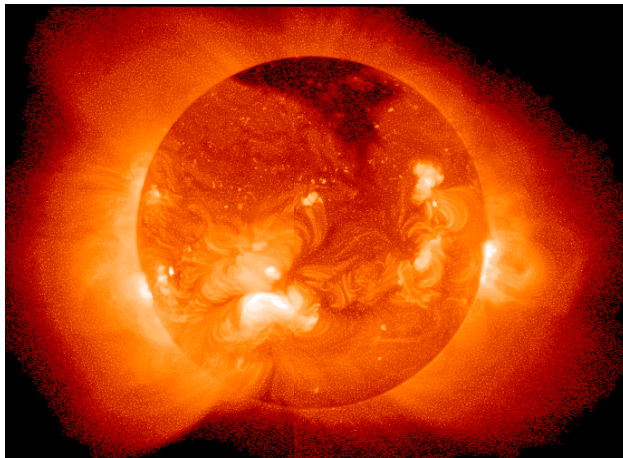
China, India, Japan, and Korea are leading the Asian space race. They are investing billions of dollars into space research and development. With so many other problems needing attention, why would these countries choose to invest so much?

There's no one answer. Military concern is one reason. Rockets that can launch a satellite into space can also carry nuclear payloads to a country's enemies. Spy satellites help see what an enemy is doing. Communications satellites link military forces.

Space research also helps develop a country's education, science, and technology sectors. India, in particular, has used its space program to increase satellite communication to remote areas for teaching and health care.

And then there is Helium-3.

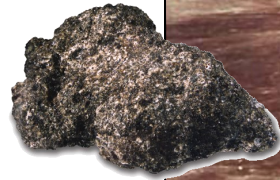
Helium-3 and the Coming Land Grab



Our Sun produces enormous quantities of helium-3. Particles of helium-3 are sent throughout the solar system by the solar wind. The Moon appears to have substantially more helium-3 than the Earth.

Mining Space for Energy

On the first lunar landing, Neil Armstrong brought back soil samples that included the isotope helium-3. There is very little helium-3 on Earth but there appears to be a large amount on the Moon. Why is this important?



Helium-3 is the key energy source for a fusion reactor. In theory, a fusion reactor is far safer to operate than the nuclear electric power reactors used today. **It offers the hope of unlimited, affordable, and safe energy. But, in order to get it, we will have to mine the Moon.**

Asia has over 60% of the world's population and a rapidly growing demand for energy. China is building around two coal-fired power plants a week in order to meet their needs. As a result, China is now one of the most polluting nations in the world.

Japan, China and India have each

launched probes to the Moon. India's probe launched in 2008 will map the surface of the Moon to find locations that might be mined for helium-3. India hopes to land a human on the Moon by 2020, ahead of a planned landing by China in 2024. The United States has announced that it too plans to return to the Moon, but U.S. space leaders predict that China will get there first. And India might be there to greet everybody..

A Lunar Land Grab in Our Future?



A company is selling land on the Moon for \$19.99 plus shipping. Over 2.5 million people have already purchased their piece of the rock. The likelihood that any of these land claims will hold up in court is somewhere between never and forget about it.

Nevertheless, the one international agreement that bans private or national claims to the Moon has never been signed by any nation that can put people into space. Our future may indeed include competition for the valuable resources on the Moon. It likely won't be pretty.

Back to the Moon | Key Terms

fusion reactor	An experimental nuclear power generator that is much safer and far less polluting than today's fission reactors.
Helium-3	A light non-radioactive isotope of use in fusion reactors. It is rare on the Earth but is thought to be more plentiful on the Moon.
isotope	One or more atoms in an element that has a specific mass. Example: "Helium-3" represents the element (helium) and the mass of the isotope (3).
satellite	Any object in space that orbits another object. The Moon is the only natural Earth satellite. Sputnik was the first man-made satellite.
Soviet Union	A former country in eastern Europe that was established in 1922 and included the nations of Russia and 14 other republics. It was dissolved in 1991. Most of the republics have become independent nations and Russia has for the most part returned to its pre-1922 boundaries.

Discussion Points

1. The rapid growth of the Asian space programs points to substantial growth of their science and technology capabilities. Can you think of other examples where Asian nations have challenged Europe, Canada, and the United States in science and technology?
2. Space technology is closely allied with military technology. Do you think there is anything to be concerned about militarily related to Asian nations success in space?
3. Many people believe competition is critical for technological progress. The idea is that competition—like a football match—inspires people to work harder and smarter to win. But space exploration is very expensive. The military benefits may give an advantage to one country over another. Instead of competition, countries could combine their research, share the costs of development, and share the benefits as well. Compare the benefits (good) and liabilities (bad) of space competition versus space cooperation.
4. The Moon does not belong to anyone or any country. Do you think nations should be able to claim territory on the Moon for mining or any other purpose? What do you think would be a good arrangement?