

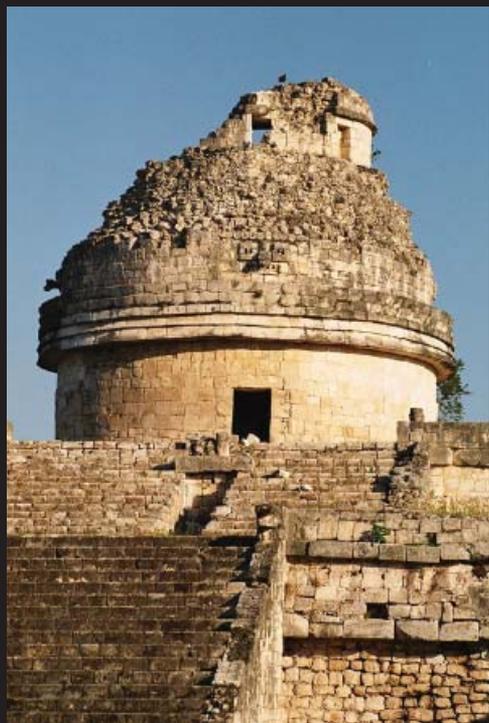
Supercool Space Tools!

By Linda Hermans-Killam





A long time ago, people looked into the dark night sky and wondered about the stars, meteors, comets and planets they saw. The only tools they had to study space were their eyes and their imaginations. They had no other tools to help them learn what these lights in the sky really were. As people studied the night sky, they noticed patterns in the stars, which we call constellations. They also noticed that different stars could be seen during different times of the year.



People discovered that mapping the position of the stars in the sky and keeping track of which stars appeared at certain times was very useful. They began to build observatories and other structures to follow the movements of the stars. This helped people keep track of the seasons and helped farmers know when to plant and harvest their crops.



*A*stronomers wanted to get better measurements of the positions of the stars. This was not only important for science but also for navigation. Sailors had learned how to use the stars to guide their way at night and they needed better measurements to get a better idea of where they were. Special tools called astrolabes and quadrants, and later on sextants, were made to measure the position and angle of objects in the night sky. By using these tools people made very good maps of the stars. But, there was still no way to get a closer view of planets and stars, or to look deeper into space.



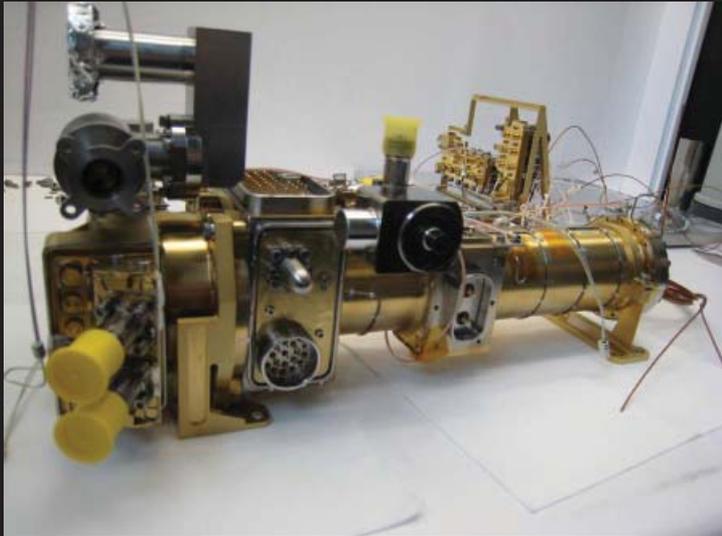
IN OMNIBUS VITIIS ET VITIIS GILBERTI INVENTUM ET OPUS, QUOD NUNC VITAM
ET EXTENSIONE IN HAC MONETA, ET SOLI SATELLITES, ET SOLI QUAM
REDEM UNIVERSITATE, POLIUM IMPERII A. 1600.

This situation changed with the invention of the first telescope. A telescope is a tool that allows you to see things that are far away. Telescopes gave people the first chance to see things in space more closely. A man named Galileo was the first person to use a telescope to look at the night sky. What he saw changed our view of the Universe. It was the first time planets were seen as more than just lights in the night sky. With his telescope, Galileo saw that there were many more stars in the sky than we could see with our eyes alone. He could see that there were mountains on the moon and that some planets had moons of their own.





arger and more powerful telescopes were built. Some used glass lenses to magnify the light from space, while others used large mirrors. Today, telescopes are so powerful that we can use them to get pictures of objects that are very far away. By using telescopes, astronomers have discovered that there are many other things in space besides stars, planets, and moons.



Telescopes help us learn more about objects in space by letting us see them up close. But, the light a telescope collects is good for more than just getting pictures. Another special space tool, called a spectrometer, lets astronomers get special information out of the light. A spectrometer splits light up into its colors and lets astronomers see the details in the light. Astronomers know how to get a lot of information about a space object by studying its light. Astronomers can find out the temperature of an object in space, which direction it is traveling, how fast it is going, its weight, and even what it is made of. Spectrometers help us learn all of this from light!



Did you know that there are many other types of light besides the light that we can see with our eyes? The type of light that we see is called visible light, but X-rays, gamma rays, ultraviolet, infrared and radio waves are also types of light. Some light, like visible, radio and some infrared, can reach the Earth's surface from space. Special telescopes, like the radio and infrared telescopes shown here, can gather and study these invisible types of light and give us a very different view of the Universe. Radio telescopes are also used to search for signs of intelligent life on other planets.





Not all the invisible types of light can reach the ground. X-rays and gamma rays, and most of the infrared and ultraviolet light from space is blocked by our atmosphere. To study these types of light, astronomers use tools like balloons and airplanes to carry telescopes and other instruments high above most of the atmosphere.



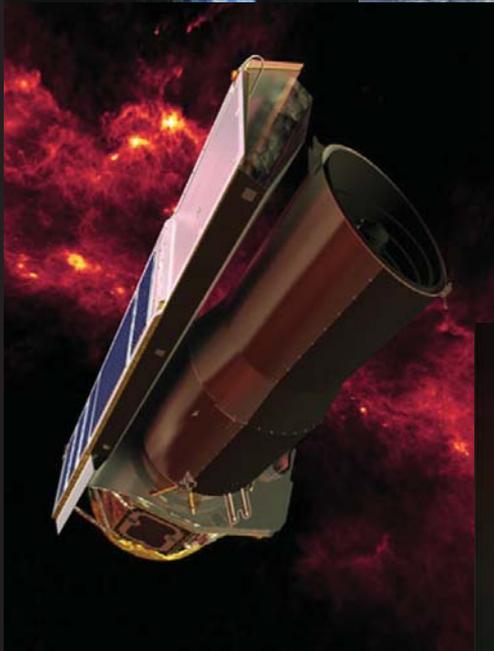
Rockets and Space Shuttles are also used to send telescopes and other instruments way above our atmosphere into space where any type of light can be studied. The Space Shuttle has carried astronauts and scientists into space and is used to help repair and add new instruments to orbiting telescopes.

Rockets were used to help send astronauts to the Moon and landers to Mars.

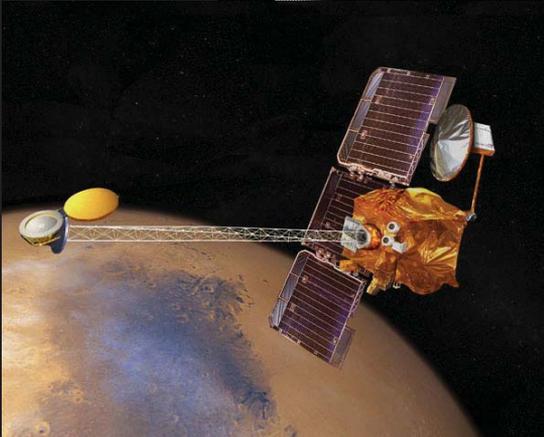
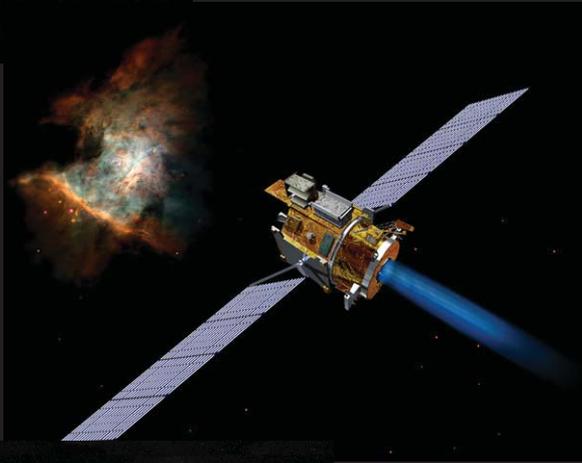
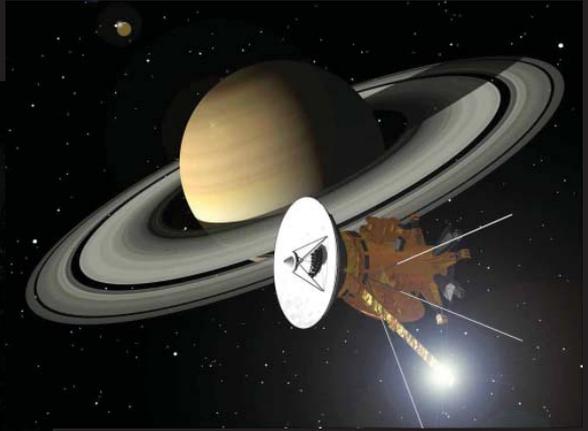
Rockets and Space Shuttles are also used to launch space probes which are sent far out into our solar system to study the Sun, planets, comets and asteroids close up.



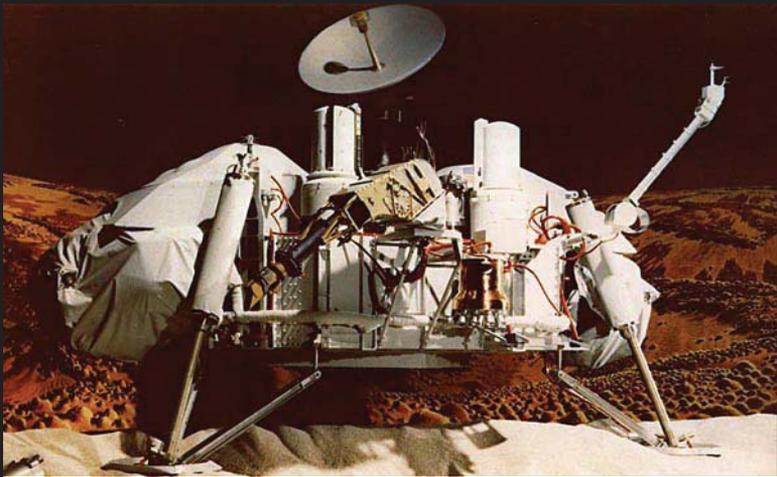
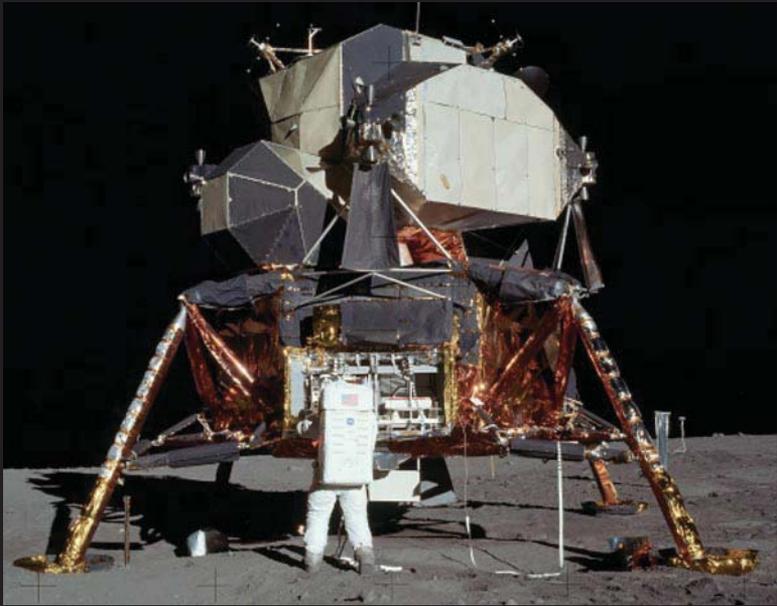
One of the largest space tools is the International Space Station, which orbits the Earth every 92 minutes! It is a huge space laboratory where astronauts and scientists can learn more about living in space and the effects of zero-gravity. Experiments onboard the Space Station will help us learn more about space and how to survive long space voyages.



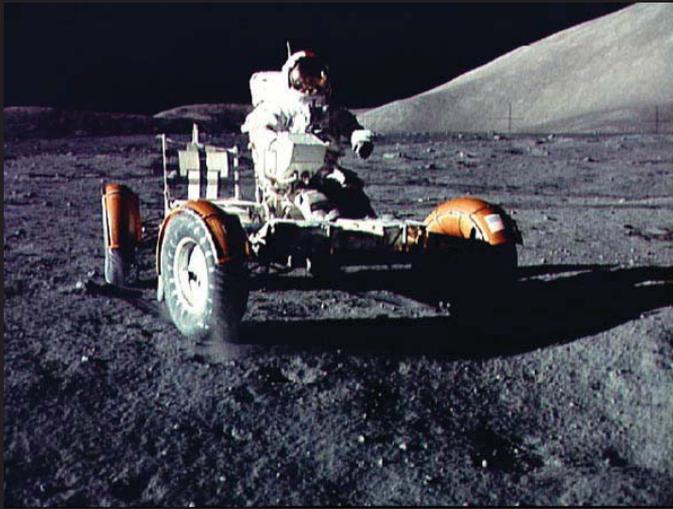
Telescopes are also placed into orbit around Earth or are sent farther out into space to get a clearer view of the Universe. There are many different types of space telescopes. Some are used to study a special object like the Sun. Others are used to study the different types of light given off by objects in space. X-ray and gamma-ray telescopes study the hottest and most explosive objects in space. Infrared telescopes study the places where stars are born and can look into the centers of galaxies. Optical telescopes study the visible light from space and ultraviolet telescopes study very hot stars.



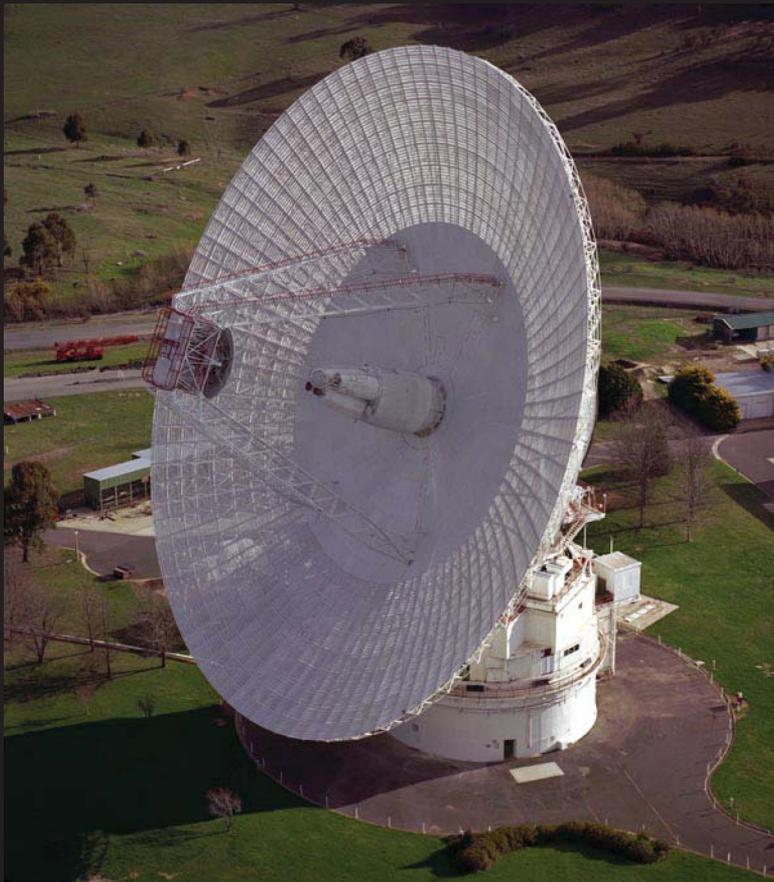
When we want to get close up pictures and information about the planets, moons, comets and asteroids in our solar system, we send out space probes. Space probes can carry special cameras and instruments far out into the solar system. Some space probes study many planets and moons while flying past them. Others go into orbit around a planet or moon to study it more closely.



*A*nother cool space tool is called a lander. Landers are used to carry people or instruments to the surfaces of planets and moons. Lunar landers carried astronauts to the Moon's surface where they collected rocks and soil to take back to Earth. Landers have also landed on Mars, giving us detailed pictures of the Martian surface and information about Martian soil and rocks.



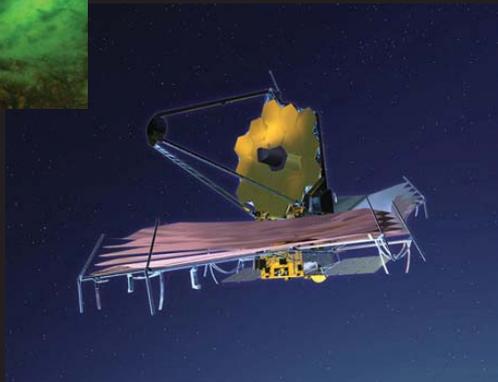
Rovers are another very cool space tool. Astronauts drove the lunar rover around on the surface of the Moon. The lunar rover allowed them to explore much more of the Moon's surface. On Mars, special robot rovers were operated by remote control. These special rovers explored the surface of Mars and allowed scientists to get close up views of Martian rocks.



Space telescopes, space probes, landers and robot rovers all need to communicate with people on Earth. They need to receive commands from Earth and send their pictures and information back to Earth. Special tools are needed to do this. All spacecraft have a special antenna which can send and receive information by using radio signals. Radio signals carrying commands to the spacecraft are sent out by powerful radio dishes on Earth. These radio dishes also receive the information and pictures sent to Earth by the spacecraft.



Computers are another very important tool for studying space. Computers are used to write programs which control spacecraft and telescopes. They are used to help test instruments before they are launched and for communication. Computers are used to study space data and to produce the amazing images we see from space. They are also used to help pass this information on to the world.



Future space tools will bring us amazing, new discoveries about the Universe and even our own solar system. Are there planets like Earth around other stars? Is there life on other planets and moons? What lies at the edge of the Universe? By using our creativity and imagination, we can build tools which may one day help solve these mysteries and many more!

The End

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- 6 *Galileo's telescope*
- 8 *Percival Lowell Telescope, Lowell Observatory, Flagstaff, Arizona; dome of 200-inch Hale Telescope at Palomar Observatory; Suburu Telescope at the National Astronomical Observatory of Japan.*
- 10 *Spectrograph now installed in the Hubble Space Telescope; Sample Analysis at Mars (SAM) Spectrometer for the Mars Science Laboratory lander mission.*
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