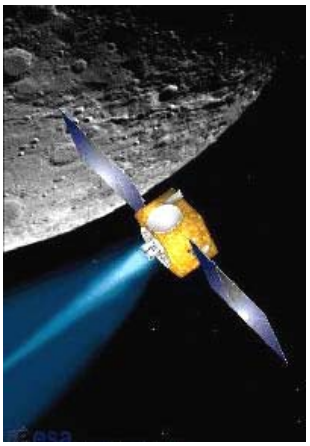
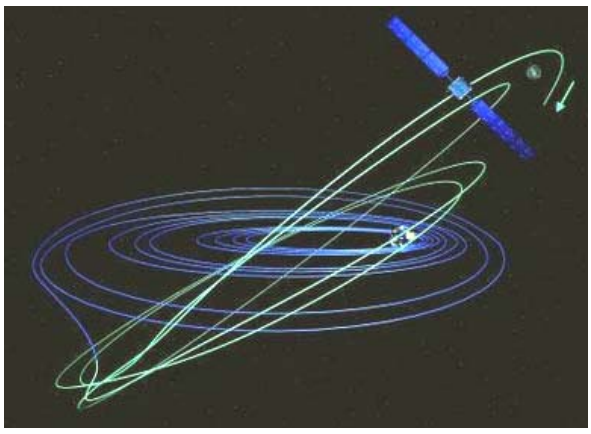
European Space Agency's SMART-1 Satellite Begins Moon Orbit.



After 332 orbits around the Earth, the European Space Agency's first lunar spacecraft called SMART-1, powered by an experimental ion drive, was fired at 05:24 UT on November 15, 2004, to bring the spacecraft into its first lunar orbit.

November 17, 2004 Darmstadt, Germany - SMART-1 is the first space probe the European Space Agency (ESA) has ever launched to the moon. SMART stands for "Small Missions for Advanced Research in Technology." This is also the first time that ESA has tried an "electric primary propulsion in space," which is an ion engine that uses a Hall-effect thruster fueled by xenon gas and powered by solar energy. SMART-1 was launched in September 2003 with the plan to make 332 orbits around the Earth, each one going further and further until its experimental ion drive was fired at 05:24 UT, November 15, 2004, to bring the spacecraft into lunar orbit. The engine will be fired repeatedly over the next two months to lower the spacecraft into an operational orbit of 3000 x 300 kilometers by January 13, 2005.



In September 2003, ESA's SMART-1 was launched with the goal of expanding each of 332 orbits around the Earth as shown in this computer simulation. As the spacecraft neared the moon, its orbits were altered by the moon's gravity which helped pull SMART-1 into its first lunar orbit on November 15, 2004. Image © 2002 by Medialab.

SMART-1 Objectives

SMART-1's mission is to orbit the moon for at least six months. ESA describes its goals this way:
"The moon's scarred face gives an impression of what the Earth looked like around 4 billion years ago, when comets and asteroids rained on the newly formed planets of the

Solar System, creating craters large and small. The Earth has mostly healed its wounds, but the Moon has scarcely changed since 3.5 billion years ago, when molten lava made the flat, dark features called maria.

From their six landings during NASA's Apollo program 1969-72, astronauts brought rock samples home for analysis in the world's laboratories. Three unmanned Soviet spacecraft also recovered Moon rocks. Scientists prized them as samples of the primordial minerals that went into building the Moon and the Earth, and as chroniclers of impacts. However, these samples were mostly from the near-side equatorial region. The far side of the Moon and polar regions, which have a quite different geological history, were not sampled.

Small American spacecraft, such as the Clementine and Lunar Prospector, went into orbit around the Moon in 1994 and 1998, carrying a variety of remote-sensing instruments to explore the whole lunar surface. Lunar Prospector also mapped the Moon's gravity and discovered magnetic regions. However, many unanswered questions still perplex the lunar scientists.

SMART-1's camera AMIE will enable scientists to study the Moon's topography and surface texture once again. It measures visible light at a million points in a field of view 5 degrees wide, and filters can select yellow light, red light or very short infrared rays. By looking at selected regions from different angles, and under different lighting conditions, AMIE will provide new clues to how the lunar surface has evolved.

With longer infrared rays, the infrared spectrometer SIR will map the surface distribution of minerals such as pyroxenes, olivines and feldspars. It will do this in far more detail than Clementine did, when it scanned the lunar surface at six different infrared bands. SIR distinguishes about 256 wavelength bands, from 0.9 to 2.4 microns. The mineralogy will reveal effects of cratering and maria formation, and the nature of subsurface layers exposed by fractures in the Moon's crust.

Looking for Ice in Dark Craters

Any water on the lunar surface would be very helpful in the creation of permanent bases on the Moon. However, to have survived, the water must be in the form of ice in places always hidden from the Sun, where the temperature never rises above -170 C. Such dark places exist, notably in the bottom of small craters in the polar regions.

The most difficult task for the SMART-1 scientists is to peer into the darkness with SIR, looking for the infrared signature of water ice and perhaps of frozen carbon dioxide and carbon monoxide. By definition, no direct light falls in the target areas. However, rays from nearby crater rims, catching the sunshine, may light the ice sufficiently for SIR to detect it, once data from many passes has been collected.

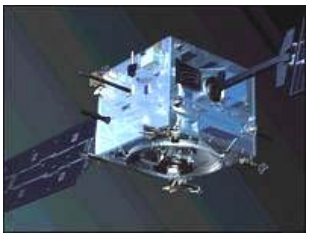
Did Moon Form After Small Planet Collided with Earth 4.5 Billion Years Ago?

The fashionable theory is that the Moon is the result of a collision during the birth of the Solar System 4500 million years ago. When the Earth was nearly complete, a gigantic wandering asteroid the size of Mars supposedly collided with our planet, flinging vaporized rock and debris from both bodies into space. Some of it went into orbit around the Earth, and solidified to make the Moon.

The impact would have greatly altered the outer layers of the Earth also. Fuller understanding of both the Earth and the Moon depends crucially on confirming or refuting this theory.

If the theory is correct, the Moon should contain less iron than the Earth, compared to lighter elements such as magnesium and aluminum. By measuring the relative amounts of chemical elements comprehensively for the very first time, SMART-1 can make a significant contribution to this momentous scientific issue.

X-rays from the Sun cause atoms in the lunar surface to fluoresce, emitting X-rays of their own. The precise energy carried by each X-ray is a signature of the element emitting it. D-CIXS is the X-ray spectrometer on-board SMART-1 that can detect these signatures."



SMART-1 by European Space Agency.

Websites:

http://sci.esa.int/science-e/www/area/index.cfm?fareaid=10

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