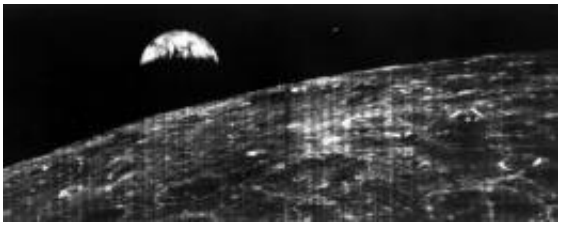
Like no other view on Earth

August 24 2011, By Ben P. Stein



The world's first view of Earth taken by a spacecraft from the vicinity of the moon. The photo was transmitted to Earth by the United States Lunar Orbiter I and received at the NASA tracking station near Madrid. This crescent of the Earth was photographed August 23, 1966 when the spacecraft was on its 16th orbit and just about to pass behind the moon. Credit: NASA

You think your vacation pictures are impressive? Try to imagine what it was like 45 years ago as scientists and engineers produced the very first images of our planet from deep space.

On August 23, 1966, NASA's Lunar Orbiter 1 took the first photo of Earth from the moon's orbit, and it forever changed how we see our home planet.

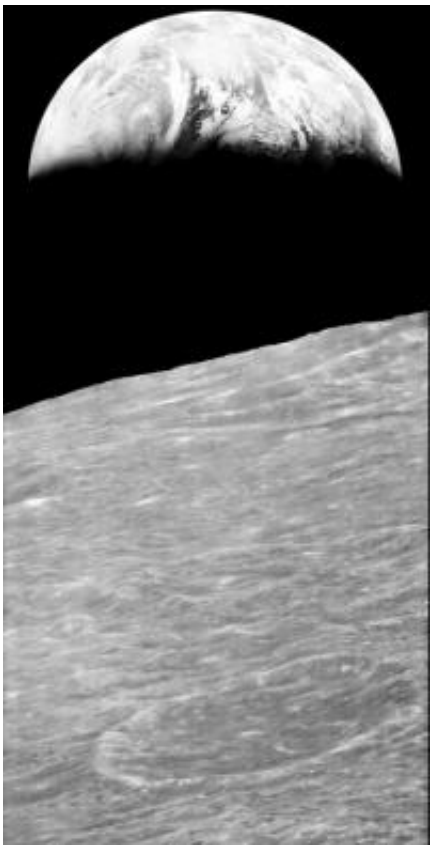
"You're looking at your home from this really foreign kind of desolate landscape," said Jay Friedlander, who started his NASA career 20 years ago as a photographic technician working on images including those from the Lunar Orbiter at NASA's Goddard Space Flight Center. "It's the first time you're actually looking at Earth as a different kind of

place," said Friedlander, currently a multimedia specialist at Goddard.

Pictures of Earth from space had been taken before, by rockets in the 1940s, and satellites in the 1950s and 1960s. However, those pictures captured just parts of Earth, as opposed to a full-on view of the planet. But that was about to change.

In the summer of 1966, the Beatles were performing their last string of public concerts, the Baltimore Orioles were on the way to their first World Series championship, the National Organization for Women was founded, and the United States was preparing to send the first humans to the moon. But before NASA could send astronauts to our lunar neighbor, they needed to find a safe place to land. So from 1966-67, the Lunar Orbiter program dispatched unmanned reconnaissance spacecraft to orbit the moon.

"The basic idea was preparing to go to the moon for the Apollo missions," said Dave Williams, a planetary curation scientist at Goddard. According to Williams, NASA "needed high resolution pictures of the surface to make sure this is something they could land on and pick out landing sites."



The Lunar Orbiter 1 spacecraft took the iconic photograph of Earth rising above the lunar surface in 1966. Credit: NASA

NASA needed to map the moon quickly. As it turned out, they could call upon off-the-shelf technology: Boeing and Eastman Kodak had previously developed a spacecraft with an onboard camera system for the Department of Defense.

The first spacecraft, Lunar Orbiter 1, left Earth on August 10, 1966 -- 92 hours later it was orbiting the moon.

It was like a flying photography lab, according to Friedlander.

"The camera system itself took up at least a third of the spacecraft," said Friedlander. Just about everything else, he said, "was power and propulsion."

The Lunar Orbiter camera contained dual lenses, taking photos at the same time. One lens took wide-angle images of the moon at medium resolution. A second telephoto lens took high-resolution images yielding details as small as 5 meters in size. For every swath of real estate on the moon that the medium resolution lens imaged, the high resolution lens would take three snapshots of smaller areas within that swath.

The entire camera contraption would have made Rube Goldberg proud, exposing, developing, and processing photographic film onboard a moving spacecraft, traveling around the moon constantly between hot and cold temperature extremes anywhere from approximately 27 to 3,700 miles above the lunar surface.

"This thing is going around the moon in zero gravity and developing film," said Williams. "It was an amazing achievement that they could do this."

The Lunar Orbiter's onboard camera contained dual lenses that took photos

simultaneously. One lens took wide-angle images of the moon at medium resolution. A second telephoto lens took high-resolution images in greater detail. Credit: Courtesy of George Eastman House, International Museum of Photography and Film

Williams said that the camera had "these big honking reels" of 70 mm film. The film would roll through, the camera would take pictures, and then move the exposed film to an automated developer. The automated film developer contained a mix of chemicals that would develop the film using a process similar to the method used by Polaroid cameras. An electron beam would then scan each developed image before transmitting the photos back to Earth using radio signals -- the same way television satellites would analog signals to TV stations.

Deployed one after the other, five Lunar Orbiter spacecraft produced a medium-detail map of 99 percent of the moon. Only in the last two years has NASA's Lunar Reconnaissance Orbiter -- still actively circling the moon -- generated higher-resolution maps of the entire lunar surface.

In addition, the first three spacecraft took highly detailed photos of 20 potential landing sites that looked promising. Friedlander said that personnel receiving the images on Earth would make giant prints of these images "and lay them out so they could walk on top of them and look for landing sites."

But at some point during the Lunar Orbiter 1's mission, NASA contemplated pointing the spacecraft's camera at Earth.

"That wasn't planned originally," said Williams. "That only came up after the mission was already in operation."

Williams said that repositioning the satellite was a high risk maneuver. "If you turned the spacecraft maybe it wouldn't turn back again. You

don't want to mess with a working spacecraft if you don't have to."

But there was a debate about whether they should even attempt this at all. In the end, Williams said that NASA decided it wanted the picture, and would not blame anyone if something went wrong during the repositioning maneuver.

So on August 23, the spacecraft successfully took a photo of an earthrise, the blue planet rising above the moon's horizon.

"NASA took the image and they created a poster of it which was given as gifts to everybody," said Friedlander. "Senators and congressmen would give it out as presents to constituents and visiting dignitaries."

More pictures followed, including the famous Blue Marble photo of the Earth taken from the window of the Apollo spacecraft. But this elaborate and complex camera system was never really used after the Lunar Orbiter missions.

"At the end of each mission, they did purposely crash the Lunar Orbiter," said Williams. "Ostensibly, [NASA] didn't want the radio signals from one lunar orbiter to interfere with the next lunar orbiter they put up."

But with the presence of the Soviet Union, which was deploying lunar orbiters of its own, Williams speculates that national security precautions may have been a factor. Since the spacecraft and camera were originally based on defense technology, they may have been smashed to bits "so that no one could ever get to them," said Williams.

Some of the extra cameras and Lunar Orbiter spacecraft that were built but never used still exist today, stored at places such as the Smithsonian Institution and at the George Eastman House in Rochester, N.Y.

The Lunar Orbiter's mission may have been accomplished long ago, but its first image of the Earth continues to inspire.

"We're on this little Earth. We're only part of some grand solar system in some big galaxy and universe. That's why this picture is important, because this was the first time that anyone on Earth got this sense," said Friedlander.

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