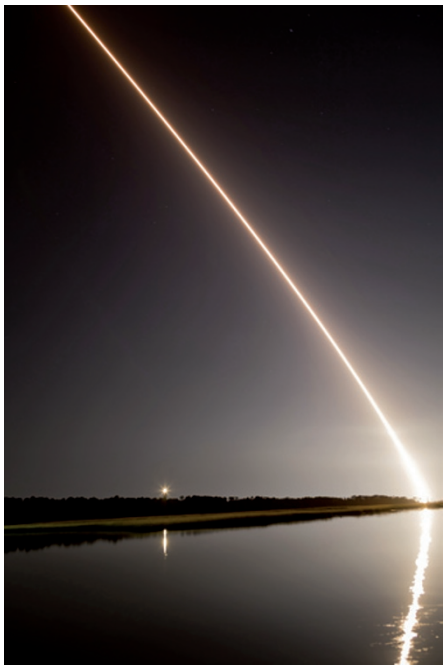
To the Moon with LADEE

NASA's latest lunar mission, the Lunar Atmosphere and Dust Environment Explorer (LADEE), arrived at the Moon on 6 October 2013. LADEE (pronounced 'laddie') is now preparing for a three-month mission to study the Moon's tenuous atmosphere. The preparations include testing the orbiter's breakthrough laser communications technology. LADEE's Lunar Laser Communication Demonstration has already achieved downlink speeds of more than 600 Mb per second in the longest two-way laser communication ever attempted.

In late November, LADEE will drop to its final orbit, skimming low over the Moon's equator. The planned orbit is nominally circular at an altitude of 100 kilometres, but, because of the Moon's extreme topography and unusually lumpy gravitational field, the spacecraft will sometimes fly within 50 kilometres of the surface. From this orbit, LADEE's dust detector and mass spectrometer will directly sample dust and gas suspended above the Moon's surface, while the ultraviolet and visible spectrometer analyses the composition of atmospheric gases. The lumpy gravitational field dooms LADEE to a very short mission. After about 100 days, it will exhaust the fuel needed to maintain its orbit, and will crash.

It may surprise some to learn that the Moon has an atmosphere at all. The lunar atmosphere is made of ions and molecules sputtered off the lunar surface. The molecules are so far apart that they almost never collide with each other. This thin, collisionless atmosphere is the most common type of atmosphere in our Solar System; Mercury, large asteroids and outer Solar System moons all possess them. LADEE is the first mission dedicated to studying the dynamics of such an atmosphere.



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One of the mysteries LADEE seeks to explore is how the atmosphere behaves as it moves in and out of sunlight as the Moon slowly rotates. In the 1960s and 70s, robotic Surveyor landers and human Apollo astronauts both witnessed a strange glow on the lunar horizon near sunrise. Scientists hypothesize that the glow has something to do with electrostatic storms on the Moon. The dayside of the Moon becomes positively charged when energetic particles in the solar wind interact with the lunar atmosphere. The solar wind carries electrons away and deposits them on the nightside, which becomes negatively charged. It is postulated that horizontal motion of electric fields from negative nightside to positive dayside leads to the electrostatic charging of dust particles, levitating them off the surface and creating a perpetual, slow-moving dust storm wherever the Sun is rising and setting. By orbiting the Moon's equator once every two hours, LADEE will sample this postulated stormy region once an hour and examine how dust and gas composition varies over the course of the lunar day.

Rocket-assisted landings on to the Moon vent huge quantities of gases into the tenuous lunar atmosphere. Upcoming landing attempts such as China's Chang'e 3 — due to launch in December 2013 — may contaminate the Moon's atmosphere. LADEE represents the last opportunity to study the Moon's atmosphere in a relatively pristine state for the foreseeable future. ❐

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The journalist's take

LADEE's launch on 6 September 2013 was a major media event. Its launch location — Wallops Flight Facility, off the coast of Virginia, USA — meant that it was visible from many major American cities, including Washington, Philadelphia, New York City and Boston. Amazing photos of the Minotaur V rocket's flare arcing over landmarks all along the United States' northeastern coast graced the front pages of newspapers and websites alike.

The media attention during the launch heightened public interest in LADEE's insertion into lunar orbit on 6 October. Its arrival at the Moon was widely reported on space and science blogs and websites, but few mainstream media outlets covered it. In fact, I found only one local newspaper that reported it on the same day. A Reuters article finally appeared very late on 7 October, more than 36 hours after LADEE achieved orbit, an unusually dilatory response for the wire service.

What happened? Between LADEE's launch and arrival, on 1 October, the United States federal government shut down. NASA staff and contractors responsible for the routine operation of active space missions were deemed essential, so their jobs continued uninterrupted and LADEE continued its journey. But NASA's public information officers were sent home, their Twitter feeds quieted and NASA websites shuttered. Most of these people are so devoted to their work that they would gladly have worked on a volunteer basis through the shutdown, but they were explicitly ordered not to do so.

Now that the shutdown is over and NASA's public relations machine is back at work, widespread reporting on NASA missions has resumed. But the lack of coverage of LADEE's arrival illustrates how traditional media outlets — TV, radio and print journals — have come to depend almost completely on public information officers writing press releases and delivering pre-packaged news stories, particularly in technical fields such as science and medicine. The function of space journalism — and therefore most public education about space exploration — is now performed largely by NASA and university public information offices. Without them, the general public would know little of our accomplishments in space.

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