



The historic Flagstaff Train Station built in 1926 is still in use today. It is the current home of the Flagstaff Visitor Center. Photo courtesy Flagstaff Convention and Visitors Bureau.

### Visitor Center Services

For more information about Flagstaff past and present, our friendly Flagstaff Visitor Center staff will be happy to assist you. We can also provide directions, free local and state maps, travel tips, self-guided tours and attraction brochures, dining suggestions and more. Browse our Gift Shop for unique Route 66 and Flagstaff attire, gifts and books.

*Open daily in the historic downtown train station.*

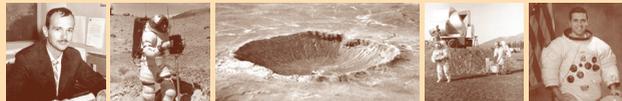
#### PHOTO CREDITS

All historic photos courtesy NASA. Aerial View of Barringer Meteor Crater by David Roddy, USGS Center of Astrogeology.

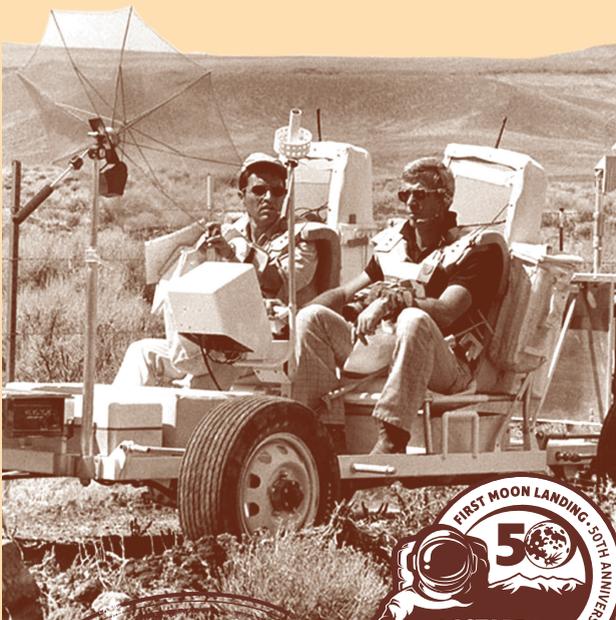
Photo of historic telescope at Lowell Observatory courtesy Flagstaff Convention and Visitors Bureau.

Front Cover: Gene Cernan and Harrison (Jack) Schmitt on USGS Grover vehicle (lunar rover vehicle simulator), September 1972.

Information for this document was taken in part from U.S. Geological Survey Open-File Report 2005-1190, titled "The U.S. Geological Survey, Branch of Astrogeology—A Chronology of Activities from Conception through the End of Project Apollo (1960-1973)" by Gerald G. Schaber. It is published by the USGS and can be downloaded free of charge from: <http://pubs.usgs.gov/of/2005/1190/> or, [pubs.usgs.gov/of/2005/1190/of2005-1190.pdf](http://pubs.usgs.gov/of/2005/1190/of2005-1190.pdf).



# Flagstaff and the History of the Apollo Moon Missions



Celebrating Flagstaff's Scientific Role in the Apollo Moon Missions  
July 20, 2019

## Flagstaff and the History of the Apollo Moon Missions

By Gerald G. Schaber, Astrogeologist

*In the decade from 1963 to 1973, a group of young geoscientists working for the U.S. Geological Survey (USGS) Branch of Astrogeology in Flagstaff, played a major role in one of Mankind's greatest achievements—the six Apollo expeditions to the Moon. July 20, 2019, will mark the 50th anniversary of the day astronauts Neil Armstrong and Buzz Aldrin landed their spacecraft "Eagle" on the surface of the Moon. Flagstaff, and its surrounding landmarks, were a vital part of the Apollo missions' success.*

### The Study of Astrogeology Comes to Flagstaff

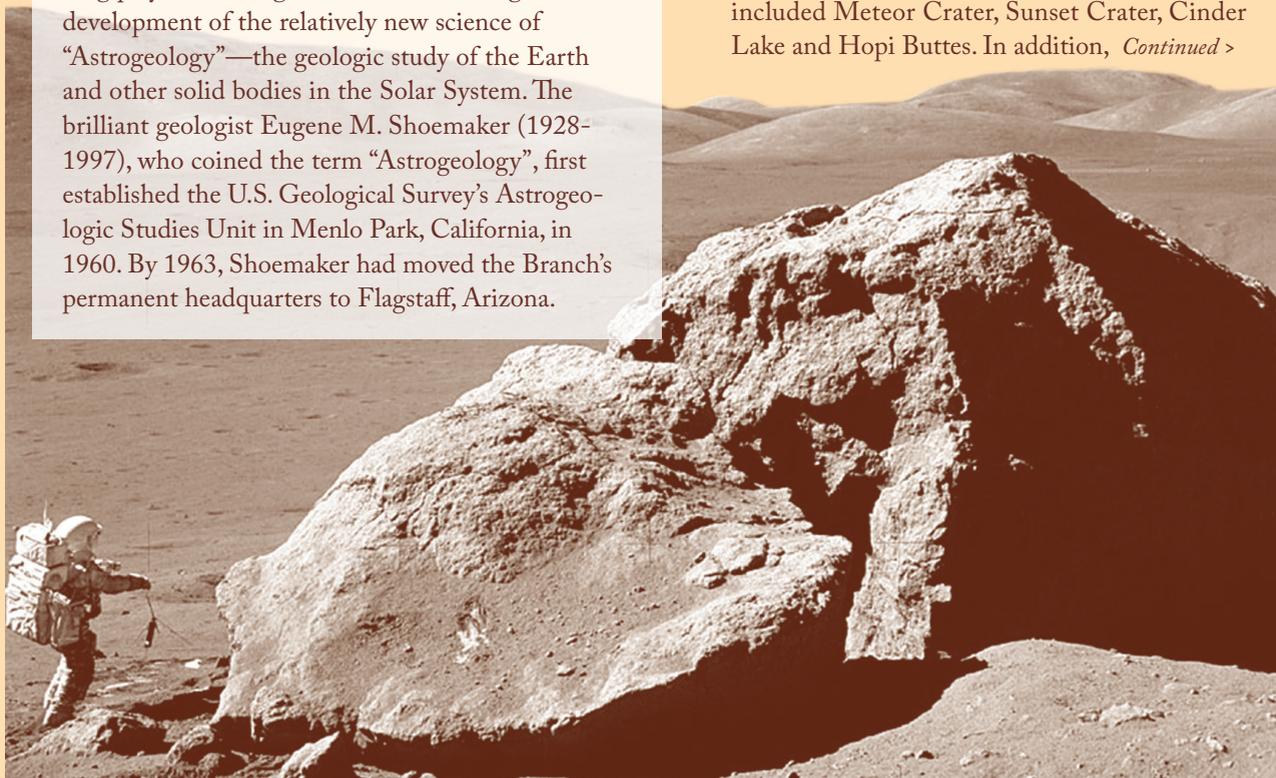
The City of Flagstaff and its local environs have long played a distinguished role in hosting the development of the relatively new science of "Astrogeology"—the geologic study of the Earth and other solid bodies in the Solar System. The brilliant geologist Eugene M. Shoemaker (1928-1997), who coined the term "Astrogeology", first established the U.S. Geological Survey's Astrogeologic Studies Unit in Menlo Park, California, in 1960. By 1963, Shoemaker had moved the Branch's permanent headquarters to Flagstaff, Arizona.

While exploring for Uranium on the Colorado Plateau during his early years with the USGS, Shoemaker fell in love with Flagstaff and decided that the quiet little town in the mountains was the perfect place to headquarter his new "Branch of Astrogeology".



Astrogeologist Eugene M. Shoemaker (1928-1997).

Shoemaker had strongly weighed the fact that Flagstaff had important additional attributes. It was centrally located near a number of natural landmarks which would be well-suited for training NASA's astronauts in general geologic field procedures. The region provided an unsurpassed first-hand study of landforms resulting from volcanism as well as impact cratering. The landmarks within easy reach of Flagstaff included Meteor Crater, Sunset Crater, Cinder Lake and Hopi Buttes. In addition, *Continued >*



Astronaut Harrison (Jack) Schmitt sampling massive moon rock at Apollo 17 landing site, December 1972.



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well-established observatories like Lowell Observatory further established that Flagstaff was the logical place to build a telescope for the Branch of Astrogeology, one designed specifically for lunar geologic observing and mapping.



*The massive impact crater, Meteor Crater, 35 miles east of Flagstaff, was a perfect location for Apollo astronaut field training.*

### The Scientific Community Takes Notice

Flagstaff began receiving scientific media attention in the last decade of the nineteenth century as a result of the rigorous scientific investigations of nearby Meteor Crater by the U.S. Geological Survey's Grove Karl Gilbert (1843-1918), and the telescopic observations of Mars and its proposed "Martian Canals" by Sir Percival Lowell (1855-1916). Northern Arizona



*The historic telescope at Lowell Observatory used in the discovery of Pluto in 1930.*

would again attract astrogeologic interest during the somewhat more well-known investigations of Meteor Crater carried out by mining engineer Daniel Moreau Barringer (1860-1929), and later with the discovery by Clyde Tombaugh in 1930 of Lowell's mysterious planet X, later given the name, Pluto.

In the early 1960s, Flagstaff became a contemporary focus of the scientific media primarily due to two major lunar activities in the area. The first was the lunar cartographic maps being prepared for NASA under the auspices of the U.S. Air Force Aeronautical Chart and Information Center (ACIC) located on

the grounds of Lowell Observatory. The second were the activities starting in 1963 that were related to: (1) lunar geologic mapping, (2) support of NASA's unmanned lunar missions, (3) field development and testing of manned lunar surface exploration methodologies and vehicles, and (4) the geologic field-training of astronauts being conducted for NASA by the U.S. Geological Survey's Branch of Astrogeology.

On May 25, 1961, Project Apollo was boldly set into motion when President John F. Kennedy gave his stirring "we will go to the Moon" speech to a joint session of Congress. It was Kennedy's goal that the nation land a man on the Moon by the end of the decade. It was the beginning of the manned lunar exploration era, and of training in the Flagstaff area for the future astronauts.

### Field Training for Lunar Exploration

These pioneering lunar research activities conducted for NASA largely in and around Flagstaff prepared NASA's astronauts very well to handle the geologic tasks they were to perform on the lunar surface.



*Field testing at Cinder Lake Crater. Flagstaff USGS geologists, acting as astronauts, tested the simulated Lunar Module for future training exercises.*



*Flagstaff's own, Harrison H. Schmitt, was Lunar Module pilot for Apollo 17.*

Branch of Astrogeology personnel also constructed for NASA a terrestrial field-training version of the Apollo Lunar Roving Vehicle (LRV) that was being developed for use during the last three (JSeries) Apollo lunar landings. This training Rover, nicknamed "Grover" for Geologic Rover, was used by the prime and backup astronaut crews assigned to Apollo missions 15, 16 and 17 during all of their geologic field-training exercises carried out for NASA by Branch of Astrogeology personnel. Grover can today be seen on display at the USGS Astrogeology Science Center in Flagstaff.

### Flagstaff's Hometown Astronaut

In July 1964, Gene Shoemaker hired geologist Harrison (Jack) H. Schmitt to work for the Branch of Astrogeology and to relocate to Flagstaff. In June 1965, Schmitt was selected to become a scientist and astronaut for NASA, and was subsequently assigned as Lunar Module Pilot on the final lunar landing mission, Apollo 17. In December 1972, he became the only geologist to date to walk on and explore the surface of the Moon.

Between January 1963 and November 1972, Branch of Astrogeology scientists based in Flagstaff would plan and lead 200 separate geologic field-training exercises for NASA's astronauts. A large number of these training exercises were carried out near Flagstaff in the areas of Sunset Crater and Cinder Lake, Meteor Crater and in the Hopi



*Field testing in Hopi Buttes east of Flagstaff. Geologist Joe O'Connor in prototype space suit, 1966.*

### From Downtown Flagstaff to the Moon

Detailed geologic mapping of the selected Apollo landing sites, planning of the Apollo surface traverses, and planning and production of the photomap packages taken to the surface of the Moon were all completed for NASA by Branch of Astrogeology personnel in Flagstaff. The (then) Arizona Bank Building in downtown Flagstaff, located at 125 E. Birch Avenue, served as the main

offices of the Branch. Today, the USGS Branch of Astrogeology remains headquartered in Flagstaff at the "Shoemaker Building" (dedicated in 2002) and USGS Astrogeology Science Center on McMillan Mesa.

### The Exploration of Space Continues

Today, scientists with the USGS Branch of

Astrogeology are still actively participating in NASA's ongoing and planned unmanned missions to various planets and satellites in the Solar System, in addition to the planned manned Mars exploration programs. Also significant are the ongoing planetary research projects by the scientists at Lowell Observatory including the Horizons mission to Pluto.

Man's greatest adventure was an amazing feat, not only to engineer the massive and technologically complex space vehicles, but to prepare men both scientifically and emotionally to explore the surface of the Moon. Twelve men explored six areas of the lunar surface during the Apollo Era, and Flagstaff's role in their training are now part of history. 🇺🇸

*For learn more about Flagstaff's Lunar Legacy, visit [flagstaffarizona.org](http://flagstaffarizona.org).*