Flagstaff and the History of the Apollo Missions

By Dr. 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, 2009, will mark the 40th 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”.

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, well-established observatories like Lowell Observatory and Flagstaff’s U.S. Geological Survey Field Center made the Flagstaff area a natural home for the Branch of Astrogeology.

The Study of Geochemistry and Volcanism

In Flagstaff, the Branch had access to the U.S. Geological Survey’s extensive geologic and geochemical databases and was able to conduct a wide-ranging exploration of the region’s geologic history. The Branch also had access to a network of Guyot geodetic stations for tracking the positions of the Apollo landers on the lunar surface. The Branch was also able to conduct a wide-ranging exploration of the region’s geologic history. The Branch also had access to a network of Guyot geodetic stations for tracking the positions of the Apollo landers on the lunar surface.

In 1963, the Branch of Astrogeology began a series of geologic surveys of the region surrounding Flagstaff, which were aimed at identifying potential landing sites for the Apollo landers. The Branch also began to collect samples from the region, which were later returned to Earth and analyzed in detail.

The Study of Meteor Crater

Meteor Crater, located east of Flagstaff, is one of the largest and best preserved impact craters on Earth. It was formed by the impact of a large asteroid or comet some 50,000 years ago. The Branch of Astrogeology conducted a detailed geologic survey of the crater, which was used to understand the geologic history of the region and to identify potential landing sites for the Apollo landers.

The Study of Volcanic Landforms

Flagstaff is located near some of the most geologically diverse areas in the world, including the San Francisco Peaks, a group of volcanic mountains that is one of the most geologically diverse areas in the world. The Branch of Astrogeology conducted numerous geologic surveys of the region, which were used to understand the geologic history of the area and to identify potential landing sites for the Apollo landers.

The Study of Lunar Surface Geology

The Branch of Astrogeology conducted numerous geologic surveys of the lunar surface, which were used to understand the geologic history of the region and to identify potential landing sites for the Apollo landers. The Branch also conducted numerous experiments on the lunar surface, which were used to understand the geologic and geochemical properties of the lunar surface.

In conclusion, the Branch of Astrogeology played a major role in the success of the Apollo missions to the Moon. The Branch was able to conduct a wide-ranging exploration of the region surrounding Flagstaff, which was used to identify potential landing sites for the Apollo landers. The Branch also conducted numerous geologic surveys and experiments on the lunar surface, which were used to understand the geologic and geochemical properties of the lunar surface.

Continued >
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.

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. Between January 1963 and November 1972, Branch of Astrogeology scientists 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 Buttes on the Navajo Nation, north and east of Winslow, Arizona.

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 (J-Series) 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 in the Foyer of the Shoemaker Building at the U.S. Geological Survey Field Staff Center on McMillan Mesa in Flagstaff.

Flagstaff’s Hometown Astronaut
In July 1964, Gene Shoemaker hired geologist Harrison 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.

1972, Branch of Astrogeology scientists 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 Buttes on the Navajo Nation, north and east of Winslow, Arizona.

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 (J-Series) 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 in the Foyer of the Shoemaker Building at the U.S. Geological Survey Field Staff Center on McMillan Mesa in Flagstaff.

Flagstaff’s Hometown Astronaut
In July 1964, Gene Shoemaker hired geologist Harrison 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.

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 Arizona Bank Building in downtown Flagstaff (presently the Bank of America building located at 125 East Birch Avenue) served as the main offices of the Branch. The U.S. Geological Survey’s Branch of Astrogeology remains headquartered in Flagstaff and personnel now occupy the new (2002) “Shoemaker Building” on McMillan Mesa.

The Exploration of Space Continues
Today, scientists with the USGS Branch of Astrogeology are still actively participating in all of NASA’s ongoing and planned unmanned missions to various planets including Pluto and satellites in the Solar System, in addition to the planned return of man to the Moon and manned Mars exploration programs. Also significant are the ongoing planetary research projects and discoveries by the scientists at Lowell Observatory.

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.