Apollo 11 moon rocks still crucial 40 years later, say researchers

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Small rock fragments from the lunar "soil" collected by the Apollo 11 astronauts in 1969. The background grid spacing is 2 mm. Photo by Randy Korotev

(PhysOrg.com) -- A lunar geochemist at Washington University in St. Louis says that there are still many answers to be gleaned from the moon rocks collected by the Apollo 11 astronauts on their historic moonwalk 40 years ago July 20.

And he credits another WUSTL professor for the fact that the astronauts even collected the moon rocks in the first place.

Randy L. Korotev, Ph.D., a research professor in the Department of Earth and Planetary Sciences in Arts & Sciences, has studied lunar samples and their chemical compositions since he was an undergraduate

at the University of Wisconsin and "was in the right place at the right time" in 1969 to be a part of a team to study some of the first lunar samples.

"We know even more now and can ask smarter questions as we research these samples," says Korotev, who is mainly interested in studying the impact history of the moon, how the moon's surface has been affected by meteorite impacts and the nature of the early lunar crust.

"There are still some answers, we believe, in the Apollo 11 mission.

"We went to the moon and collected samples before we knew much about the moon. We didn't totally understand the big concept of what the moon was like until early 2000 as a result of missions that orbited the moon collecting mineralogical and compositional data.

"It's only been fairly recently that we decided that we should look closer at these Apollo 11 samples."

Korotev credits the late Robert M. Walker, Ph.D., Washington University's McDonnell Professor of Physics in Arts & Sciences, and a handful of other scientists for the fact that there are even moon samples to study.

"Bringing samples back from the moon wasn't the point of the mission," says Korotev. "It was really about politics. It took scientists like Bob Walker to bring these samples back — to show the value of them for research.

"Bob convinced them to build a receiving lab for the samples and advised them on the handling and storage of them.

"We didn't' go to the moon to collect rocks, so we scientists are really

lucky that we have this collection."

Korotev points out that by the last Apollo mission — Apollo 17 — one of the astronauts onboard was a geologist, Harrison H. Schmitt.

Walker was recruited to serve on the scientific team that advised NASA on the handling and distribution of moon rocks and soil samples from the first Apollo missions. That team distributed Apollo 11 samples to some 150 laboratories worldwide, including WUSTL.

Walker also briefed those early astronauts about what to expect on the rocky, dusty moon surface.

In an interview some months after the first moon samples arrived in WUSTL's space sciences lab, Walker recalled the excitement of that momentous day in 1969: "We felt just like a bunch of kids who were suddenly given a brand new toy store ... there was so much to do, we hardly knew where to begin."

Ghislaine Crozaz, Ph.D., professor of earth and planetary sciences emerita in Arts & Sciences at Washington University and a member of Walker's space sciences group that was one of those selected to study the first lunar samples, says the event is "as vivid in my mind as if it had happened yesterday."

Crozaz says that the team studied the cosmic rays and radiation history of the lunar samples mainly using nuclear particle tracks, which were revealed by techniques invented by Walker.

"After we received the samples in early September, we worked like hell until the First Lunar Science Conference in early January 1970 in Houston, where we arrived with our *Science* paper after having worked 'incommunicado' for 4 months."

In their study of the lunar materials, Walker's laboratory led the way in deciphering their record of lunar, solar system and galactic evolution. Of special importance was the information they gave on the history of solar radiation and cosmic rays.

Crozaz, who later became Walker's wife, says the lunar samples provided insights into the history of the solar system that couldn't be achieved at the time by looking at meteorites found on Earth. The intense heat encountered during their passage through the atmosphere would have erased much of the record of radiation the meteorites carried.

The Apollo 11 samples — and samples from almost every Apollo mission until the last one in December 1972 — have been securely housed on the 4th floor of the physics department's Compton Laboratory and used by numerous WUSTL researchers, including many members of the McDonnell Center for the Space Sciences. The McDonnell Center was established in 1974, with Walker as its inaugural director.

Today, the remaining lunar samples in Compton Hall that arrived in 1969 from the Apollo 11 mission and from subsequent Apollo missions in the 1970s are being painstakingly prepared for a return trip to Houston to NASA's moon rocks repository, the Lunar Sample Building at the Lyndon B. Johnson Space Center in Houston, Texas.

"The samples have been exhaustively analyzed and numerous papers have been published showing interesting research results," says Ernst K. Zinner, Ph.D., research professor of physics and of earth and planetary sciences, who joined Walker's lab in 1972 studying Apollo mission samples before focusing on analysis of stellar dust grains found in primitive meteorites.

"We have finished analyzing these particular samples and we're focusing

on other extraterrestrial samples. In a sense, our lab in Compton has moved from the moon to the stars in our research interests.

"It is a great and serious responsibility to hold and guard these samples, which are absolutely irreplaceable."

In the meantime, in the Earth and Planetary Sciences Building, next door to Compton Hall, Korotev, who received his Apollo 11 samples from NASA much later — not until 2005 — still has much work to do with his samples, which have been chemically analyzed and are sealed in tubes and securely stored away for now.

"You can look at the moon and know that the moon has been hit a lot by very large meteorites," says Korotev. "We know this occurred some 3.9 billion years ago.

"We don't know, however, the history of large meteorites hitting the Earth — we can't see those impacts because they would have been erased by Earth's active geology.

"We want to see if meteorite bombardment on the moon coincided with what was happening on Earth, and, in turn, with life starting on Earth," says Korotev, who as a 20-year-old chemistry major in 1969, decided his career path after working with the Apollo 11 rocks.

"The whole experience decided my career. I went to graduate school in 1971 to study lunar geochemistry so that I'd know how to interpret the chemical data we obtained in terms of lunar geology. That's what I'm still doing!"

Source: Washington University in St. Louis (news : web)