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Robinson's research gives astronauts lay of the (lunar) land

The next astronauts to go to the moon will know where to land, thanks to a powerful camera run by one of ASU's own.

“I'm allowed to work only on ‘M' bodies: The moon, Mercury, Mars, minor planets … you get the idea,” jokes Mark Robinson, a professor of geological sciences in ASU's new School of Earth and Space Exploration (SESE).

Robinson, who came to ASU late last semester from Northwestern University, is a planetary scientist with a long trail of publications. These cover many solar system objects, with most of them beginning with the letter “M.” But that's not how he started.

“My undergraduate degree combined political science and art history,” he says.

While interesting, it didn't prove useful after graduation.

“I was working as a busboy in a Seattle restaurant, and a friend mentioned he had turned down a job at a field camp in Alaska ,” Robinson says.

That might beat wiping off tabletops, he thought.

“I called, and within 48 hours I was on a plane to Alaska ,” he says.

Twelve hours after that, a helicopter dropped him off at a gold-mining survey camp in the bush.

“I thought this was really cool,” Robinson says. “Getting paid to go hiking, pick up some rocks and mark them on a map.”

After his stint at the camp, Robinson went to the University of Alaska , “where I basically did an entire second undergrad degree” in geology, he says.

Picturing planets

What directed Robinson's focus outward from Earth was a copy of a NASA publication, “Viking Orbiter Views of Mars.” This book provided a well-illustrated guide to the Red Planet, as scientists knew it, circa 1980. He began to work with Mars images, processing the photos to bring out everything the spacecraft cameras had captured.

That led him to the general subject of Mars geology – and, with it, contact with famed planetary scientist Ronald Greeley, a Regents' Professor in the School of Earth and Space Exploration, an academic unit in ASU's College of Liberal Arts and Sciences.

Graduate school took Robinson to the University of Hawaii , where he worked with researchers studying Mars, Mercury and the moon. Remote sensing remained the focus of Robinson's interests, and most of his thesis, finished in 1993, concerned Martian volcanoes as seen in Viking orbiter images.

The moon miner's daughter

His next target lay closer to home: the moon.

“I was going to be a postdoc on the Mars Observer mission, working for Alfred McEwen (then at the U.S. Geological Survey in Flagstaff, Ariz.), but that never happened because the spacecraft blew up in August 1993,” Robinson says.

About a month later, while Robinson was working at the National Air and Space Museum in Washington , D.C. , McEwen called again.

“He offered me a job working on Clementine. ‘Sure,' I said. ‘That sounds fantastic. What is it?' ”

Launched in January 1994, Clementine was a whimsically named moon mission that originated not with NASA, but the U.S. Department of Defense. The mission's goal was to test military sensors in deep space. The spacecraft was intended to orbit the moon then go on to minor planet Geographos.

Because of a hardware glitch, Clementine ran out of maneuvering fuel as it headed for Geographos, but before the mishap the spacecraft spent two months in lunar orbit, sending back a wealth of data.

Revisiting a warm place

Around the same time, Robinson recalibrated old data from the Mariner 10 mission to Mercury (1973-1975) in collaboration with Paul Lucey of the University of Hawaii . Their work used geological inferences, plus a complex algorithm, to extract mineralogical information about the surface rocks of the sun-toasted planet. This information had lain hidden in the old data for roughly 20 years.

Neglected since Mariner 10 days, Mercury is the target for the MESSENGER mission, which was launched in August 2004. MESSENGER, short for “Mercury Surface, Space Environment, Geochemistry, and Ranging,” will make three “flybys” of the planet in 2008 and 2009 before going into Mercury orbit in March 2011.

Robinson's role, as part of MESSENGER's science team, is to study the planet's geology and help map its surface using image analysis and stereogrammetry.

Back to the moon

In January 2004, President George W. Bush gave the country and NASA the goal of returning humans to the moon, then going on to Mars. While the Apollo program put American astronauts on the moon in 1969-1972, the new plans call for much more ambitious expeditions that will culminate in a permanent lunar base. To do this, NASA has begun a series of robotic moon missions.

The first of these is the Lunar Reconnaissance Orbiter (LRO), due for launch in October 2008. Robinson is the principal investigator for the imaging system, known as LROC (short for Lunar Reconnaissance Orbiter Camera). He is deeply involved with building a science operations center for LROC on ASU's Tempe campus.

“The Lunar Reconnaissance Orbiter mission is designed to let us make intelligent decisions on where it's safe to land humans on the moon in 2018,” Robinson says. “It's a science and engineering mission.”

Of crucial importance is gaining knowledge of the lunar polar regions, which shape up as attractive sites for human exploration bases.

“We'll be looking at every piece of ground under all kinds of illumination, from grazing light at local

sunrise through local noon to grazing light from the opposite direction at sunset," he says.

But LRO's mission won't stop there.

"We're going to rephotograph areas of the moon that were imaged during Apollo at 1-meter resolution," he says. "We'll be looking for new impact craters or other changes since Apollo days."

ASU's gravity field

What drew Robinson to ASU was a sense of excitement about the School of Earth and Space Exploration.

"I was attracted by the big gamble the university's taking in merging geosciences with astrophysics and parts of engineering. SESE is a huge experiment, but it makes perfect sense," Robinson says. "We need people who know about the science and the engineering working together to maximize our ability to explore and do great science."