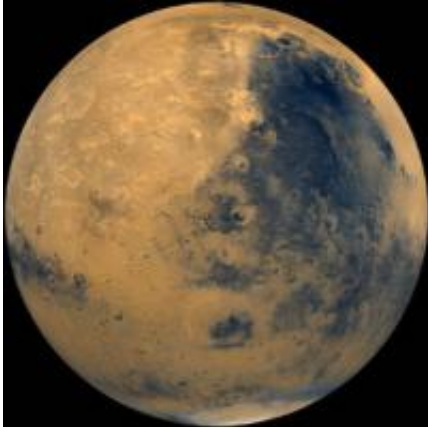


Seeing Mars through the eyes of a geologist

August 4 2012, By Amina Khan



Mars. Image: NASA

John Grotzinger is leading a march up a mountain near Death Valley, the rocks around him streaked red, brown and purple-gray.

The geologist has often brought staff members up here, away from the blinking control rooms and glaring light of test beds at the Jet Propulsion Laboratory about 250 miles to the southwest.

Engineers who normally fiddle with electronics will smash rocks with geologists' hammers. Planetary scientists will practice tracking layers of rock to piece together the story of the land.

It's a break from the lab grind, but that's not the point. As project scientist for the Mars [Science Laboratory](#), the NASA rover scheduled to

land on the Red Planet on Sunday night, Grotzinger guides hundreds of researchers who work with rover instruments that will capture video of the terrain, scoop up soil or shoot lasers at rocks, in search of the ingredients for life.

Once the rover - nicknamed Curiosity - touches down, the crew will see the landscape through the machine's eyes only. These trips into the forbidding desert help them to develop a gut sense of the [Martian terrain](#) and to start thinking a bit like a Mars rover themselves.

"Until you're actually staring at a rock outcrop and walking around it, you don't have the intuition of what this rover's going to do on Mars," said Ashwin Vasavada, one of Grotzinger's two deputies, recalling a 2008 field trip.

"He would ask us, 'If you were the rover, where would you drive? Where would you point your camera? How would we, as a team, explore this particular site, if this was what was in front of us on Mars?' "

Grotzinger, 55, is tall and rangy, with blue eyes constantly drawn to the ground.

As a college student at upstate New York's Hobart College in the 1970s, he played lacrosse and took a "rocks for jocks" geology course to fulfill a requirement during his third year.

He got hooked.

Don Woodrow, his geology professor there, recalled how the young Grotzinger would read his textbook in a room near Woodrow's office. An "Oh my God!" would break the bookish quiet, then the sound of

running footsteps, and Grotzinger would burst through the door to rave about some new geology factoid.

"It just captured him," Woodrow said.

Still, Grotzinger's uncle, Preston Cloud - himself a famed geologist and paleontologist - thought the lad was too scattered. Paul Hoffman, a Harvard professor emeritus of geology, recalled Cloud's request: "I have a nephew who's just like a big hound. He has lots of energy but no focus. Take him up to the Northwest Territories and see if you can make something out of him."

Hoffman obliged, and soon found that his new field assistant stood out. Other students would gape at the Canadian sky or soak in the scenery, but not Grotzinger.

He has "eyes a bit like a wolf, when he looks at a rock. It's like he's drilling holes in the rock, the intensity of his inspection," Hoffman said.

For much of his post-Ph.D. career, the geologist kept his feet planted firmly on Earth. He combed ancient sedimentary rocks for signs of early life. He took trips around the globe, family in tow, to collect 550 million-year-old specimens in Namibia and Oman.

He would send them to his lab and pore over them, charting the rise and fall of ancient oceans by analyzing the carbon isotopes they contained.

His move into Mars research was something of a happy accident.

In 2001, a friend suggested he apply to NASA for a spot in the Mars Exploration Rover program, whose twin rovers Spirit and Opportunity were on a hunt for signs of water on the surface of the Red Planet. Almost on a whim, Grotzinger applied. Competition for these slots was

fierce, but to his surprise he was picked to be a scientist with the 90-day mission.

"I thought, 'Gosh, this is gonna be fun ... and after 90 days I'll go home,' " he said.

But then Opportunity began sending back images from its landing site, Meridiani Planum, a flat, ashy expanse near the planet's equator, that stopped him in his tracks.

Scientists expected the plain to be full of long-hardened magma spewing from the [Red Planet](#)'s innards.

Instead, Meridiani was filled with sedimentary layers eerily reminiscent of the structures Grotzinger had studied in Namibia. And he soon saw small round "blueberries" made of hematite, an iron-rich mineral that indicated the past presence of water.

"It was really lucky for the Mars program that there was a sedimentologist like John ... ready to recognize what they were seeing," said Dave Rubin, a researcher with the U.S. Geological Survey in Santa Cruz.

"That experience is burned in my mind forever," Grotzinger said.

Decades of staring at rocks had paid off. But the Mars mission was a turning point in other ways, said Grotzinger's wife, Donna.

"John suddenly realized he was really good at working in a group, building a consensus and interacting with people," she said. "A lot of scientists don't want to do that. ... It's like herding cats, a lot of times."

Grotzinger kneels in the test bed at JPL, with about 30 scientists and engineers. Cellphones flash as lab-coated researchers hop in front of cameras, mugging an SUV-sized test robot - the spitting image of Curiosity - in the background.

It's the first time many have seen the test rover up close, and they are as excited as fans are to catch a glimpse of a Hollywood star.

More pragmatically, they now get a chance to see how the rover moves and how the instruments work together. Grotzinger is taking note himself, studying a plume of dust billowing up from the rover's whining drill, asking engineers about the plume's potential to contaminate other instruments.

Sitting in the sand, the geologist is focused on the details. But sometimes the job requires him to step back, take a wider view.

In a meeting a few weeks ago, Grotzinger realized that with all eyes trained on the place the rover will explore - a mound in the middle of Gale Crater - the landing site had been neglected. He decided to map the site in detail, with topography, mineralogy and other data.

By temperament, [geologists](#) tend to prefer to draw their maps solo. But there was no time. So he cut the site into 68 squares and put out a call to the whole rover team to pitch in.

Foreign scientists jumped at the chance. Some decided to fly in early to help. Each researcher took at least one square, and each mapped their four-sided universe.

Grotzinger took in the whole picture. For the most part, to his delight, the edges lined up.

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