

Meet A Planetary Scientist — Dr. Carlé Pieters, Brown University

What do you do? I study the solid, rocky terrestrial bodies — Earth, Mercury, Mars, Venus, and the Moon. I decipher the composition and history of planets by looking at their rocks. I start by asking “Where are the different types of rocks and how did they get there?” On Earth, the rocks are eroded by wind and water and squished and folded into mountains. On other planets (and Earth, too) impactors strike the surface and break up the rocks and send them to different places. The next question I ask is “What are the rocks made of?” I use a tool called a “spectrometer” to answer this question. The components making up a rock — minerals — reflect light differently. Each has its own reflection “fingerprint.” Some minerals reflect more red light and others reflect more blue light. But they also reflect wavelengths of light that our eyes cannot see. Spectrometers detect the light we can see and the light that is invisible to us. We use spectrometers to measure the light reflected from the surface of a planet so that we can determine what rocks and minerals are there and where they are located.

What have you investigated on the Moon? I look at the minerals on the surface of the Moon — but these minerals tell us what’s deeper inside the Moon! I investigated Copernicus Crater, a big crater, about 60 miles (93 kilometers) across. There is a mountain in the middle, called a central peak, that forms when rocks from deep under the crater rise up after the impactor hits. I discovered that the central peak in Copernicus has a lot of olivine, a very pretty green mineral.

One of our questions is how the olivine in Copernicus Crater got where it is. One possibility is that the olivine comes from deep within the Moon, from its middle layer, the mantle. If the olivine is from the mantle, then the impactor must have dug really deep into the Moon! Another possibility is that chambers of magma cooled slowly under the surface of the young Moon, and the olivine separated out, forming a pocket of olivine — a pluton — that was excavated by the impactor that formed Copernicus Crater. These two theories offer two very different pictures about the structure of the Moon and its history. As we learn more, we will be able to determine which is correct — or if there is a different answer. By building this type of understanding of where minerals are and how they got there, we can begin to predict where we will find resources.

Why should we return to the Moon? The Moon has a huge role in science! Our Moon preserves a record of our early solar system and early Earth that has been erased from all the terrestrial planets. Unlike the planets, which continued to have their surfaces modified by volcanism and erosion and tectonics, our Moon became geologically quiet early in its history, other than being struck by impactors. By studying it we will build our understanding of how planets, like Earth, form and change.

Our planet Earth is limited in resources and in space. We will need to go to other places in the solar system to gather resources and fuel. The Moon, because it is so accessible, is a natural part of human exploration and investment in our own future.

If someone wants to become a scientist, what should they do? When I was young, I was curious about things — how things happened or what things were made of. Sometimes I found that my questions had answers, but many did not and that is what made it interesting to me. This is one reason I have always liked math; math beyond arithmetic is just about solving puzzles. Math is a very important tool that helps me solve problems and do what I do.

If someone wants to be a scientist, they should study math and science in school so that they will have the tools to use in science. More importantly, they should ask questions, lots of questions — even questions that don’t seem to have answers. This is very important because then they can design a way to get the answer! There are so many opportunities for young scientists and scientists-to-be around the world to help ask and answer interesting questions about the Moon!

