In situ geochronology on Mars and the development of future instrumentation

Barbara A. Cohen

NASA Goddard Space Flight Center, Greenbelt, MD, USA

Dr. Barbara Cohen is a planetary scientist at NASA Goddard Space Flight Center. Originally from upstate New York, Dr. Cohen earned her BS in Geology from the State University of New York at Stony Brook and her PhD in Planetary Science from the University of Arizona. Her main scientific interests are in geochronology and geochemistry of planetary samples from the Moon, Mars and asteroids. She is a Principal Investigator on multiple NASA research projects, a member of the science teams operating the Mars rovers Opportunity and Curiosity, and the principal investigator for Lunar Flashlight, a lunar cubesat mission that will be launched in 2019 as an SLS secondary payload. She is the PI for the Mid-Atlantic Noble Gas Research Laboratory (MNGRL) and is developing a flight version of her noble-gas geochronology technique, the Potassium-Argon Laser Experiment (KArLE), for use on future planetary landers and rovers. She has participated in the Antarctic Search for Meteorites (ANSMET) in four seasons, where she helped recovered more than a thousand pristine samples for the US collection. Asteroid 6816 Barbcohen is named for her.

Abstract: Several *in situ* geochronology experiments have been conducted by the Mars Science Laboratory mission's Curiosity rover to understand when the Gale Crater rocks formed, underwent alteration, and became exposed to cosmogenic radiation. These experiments determined that the detrital minerals in the sedimentary rocks of Gale are ~4 Ga, consistent with their origin in the basalts surrounding the crater. The sedimentary rocks underwent fluid-moderated alteration 2 Gyr later, which may mark the closure of aqueous activity at Gale Crater. In the last several million years, wind-driven processes have dominated, denuding the surfaces by scarp retreat. The Curiosity measurements validate radiometric dating techniques on Mars and guide the way for future instrumentation. I'll also discuss the current state of the art in *in situ* dating development for Mars, including the K-Ar, Rb-Sr, Pb-Pb, and luminescence systems, to make more precise measurements that will further our understanding of the geologic and astrobiologic history of the planet.