Monday, March 5, 2018

New Location

Live Oak Room • Norris Conference Center • 816 Town and Country Blvd #210
Social Hour 5:30–6:30 p.m.
Dinner 6:30–7:30 p.m.

Cost: $40 Preregistered members; $45 non-members/walk-ups

To guarantee a seat, pre-register on the HGS website & pre-pay by credit card.
Pre-registration without payment will not be accepted.
Walk-ups may pay at the door if extra seats are available.

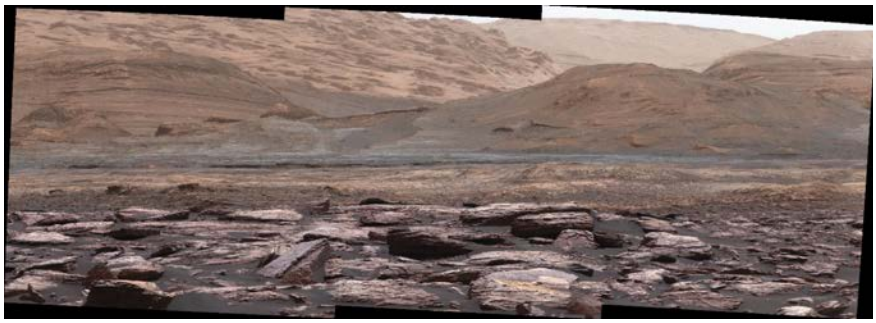
If you are an Active or Associate Member who is unemployed and would like to attend this meeting, please call the HGS office for a discounted registration cost. We are also seeking members to volunteer at the registration desk for this and other events.

HGS General Dinner Meeting

Kirsten Siebach
Rice University

Sedimentary Records from Another World: Exploring Gale Crater Basin with the Curiosity Rover

The Mars Science Laboratory rover, *Curiosity*, landed on the floor of Gale crater, Mars, on August 5, 2012. In the last 5.5 years, Curiosity has traversed over 11 miles (18 km) to explore 1,200 ft (370 m) of basin-fill stratigraphy exposed as layered sediments preserved around the craters' central peak, a 16,000 ft (5 km) tall stack of sediments dubbed Mount Sharp.



A portion of Mount Sharp, the preserved mound of sedimentary rocks in Gale crater [NASA/JPL/MSSS]

Along this traverse, *Curiosity* has collected tens of thousands of images of the Martian surface in addition to 500,000 laser shot-based chemistry analyses, 600 bulk chemistry analyses. The lab rover has 15 drilled samples observed with both a mass spectrometer and an x-ray diffractometer, sending the data back to Earth on a daily basis. The instrument suite onboard *Curiosity* has enabled the highest resolution ever achieved in in-situ imaging of planetary surface samples, the first age date on another planet, ongoing chemostratigraphy based on multiple scales of compositional measurements, and ten robotic Martian selfies.

Selfie taken by Curiosity *1941 sols (Martian days) after landing, with sand dunes and Mount Sharp [NASA/JPL/MSSS].*

Far beyond the numbers, *Curiosity*'s findings have revolutionized our understanding of Mars. Whereas it was once thought that Mars may have only had intermittent short-lived periods of relatively clement atmospheric conditions, *Curiosity* has investigated over 300 m of mudstone deposited in a lake of liquid water that would have potentially had habitable conditions for life ~3.5 billion years ago that seems to have been sustained

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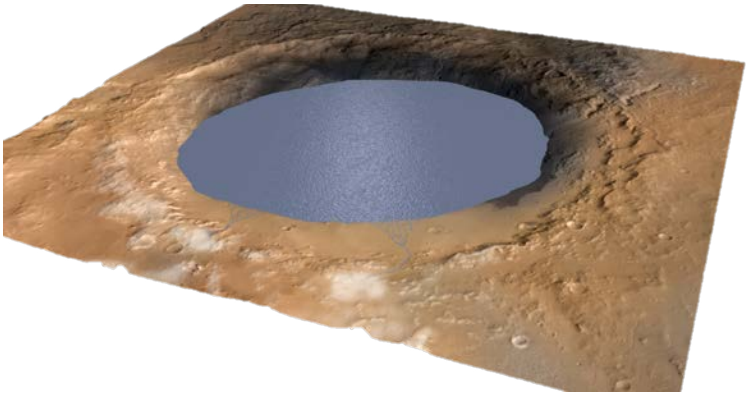

Simulation of lake in Gale crater [NASA/JPL].

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for at least 3 million years. These lake (and associated fluvial and deltaic) sediments underwent multiple episodes of diagenesis suggesting groundwater was present for long durations. The presence of cemented sedimentary strata that overlie angular unconformities show that significant fractions of the 152-km-diameter crater were filled with water-cemented sediments and then largely evacuated by wind at least twice prior to ~3 billion years ago.

Curiosity has also shown that early Mars had more igneous diversity than previously predicted, eolian bedforms with distinct wavelengths formed under different atmospheric conditions and today has active sand dunes and seasonal variations in atmospheric methane.

Professor Siebach will present the developing story of the history of the Gale crater basin and the basin analysis work she has done to understand source-to-sink processes by separating chemical effects from source rock diversity, sediment transport, and diagenetic influences for multiple sedimentary cycles. ■

Biographical Sketch

Kirsten Siebach is an Assistant Professor in the Department of Earth, Environmental, and Planetary Sciences at Rice University. Her work focuses on understanding the history of water interacting with sediments on Mars and early Earth through analysis of sedimentary rock textures and chemistry. She is currently a member of the Science and Operations Teams for the Mars Exploration Rovers and the Mars Science Laboratory.

Kirsten attended Washington University in St. Louis, where she graduated summa cum laude with a BA in Earth & Planetary Science and Chemistry. She completed her PhD in Geology at Caltech under Dr. John Grotzinger. Her dissertation study "Formation and Diagenesis of Sedimentary Rocks in Gale Crater, Mars" was followed a postdoctoral research in geochemistry of Martian sediments at Stony Brook University.

She is actively engaged in promoting education and outreach related to Earth and Planetary science and regularly presents at schools and outreach events. Outside of professional interests, she loves travel and photography (on Earth as well as Mars), and enjoys swimming, hiking, and social dancing.