



The Trail of Time icon gives a cyclic view of rocks, time, and erosion at Grand Canyon



The Grand Canyon at the foot of the Toroweap- looking east, lithograph by William Henry Holmes from Clarence E. Dutton, Tertiary History of the Grand Cañon District with Atlas, 1882

## **GRAND CANYON GEOLOGY AND GEOSCIENCE EDUCATION PUBLIC SYMPOSIUM, April 18-20, 2019**

In honor of Grand Canyon National Park's 2019 Centennial celebration, Earth Day 2019, and the 150th anniversary of John Wesley Powell's 1869 pioneering Colorado River expedition

### Conveners

Karl Karlstrom, University of New Mexico (Grand Canyon geology and tectonics)

Laura Crossey, University of New Mexico (hydrochemistry and hydrology)

Steven Semken, Arizona State University (geoscience education and ethnogeology)

Todd Stoeberl, Chief of Interpretation, Grand Canyon National Park

Jeanne Calhoun, Chief of Science and Resource Management, Grand Canyon National Park

### Objectives

Grand Canyon is one of the world's iconic geologic laboratories and has long served as a centerpiece for geoscience education and science literacy. This symposium honors 100 years of geoscience education at Grand Canyon National Park and 150 years of Grand Canyon geology research. The objective is to provide an update on geologic research and on innovations in geoscience education that have taken place at Grand Canyon. The goal is to promote a next century of geologic research and outreach in this iconic region. The symposium is open to the public as well as the geoscience community.

### Agenda

Thursday April 18, 2019: Speakers and participants arrive and check in (Albright Center for accommodations; Mather Campground for camping)

Friday April 19, 2019: Geology of Grand Canyon 8:30-5:00 PM.

Saturday April 20, 2019: Geoscience Education 8:30-12:30, and walk the Trail of Time 2-5 PM with geologists.

### Attendees and Estimated Costs

The meeting sessions will be held at the Shrine of the Ages Auditorium near the Park Headquarters. They are free to the public and Saturday is a no-fee entrance day to the Park. Accommodations for speakers at Albright may be available (~\$100 per night) and camping at Mather Campground group site (free) is available for speakers and those who register in advance (email kek1@unm.edu). Speakers will give ~15 minute presentations and facilitate 10 minutes of Q and A about their topic.

## **Geology and Geoscience Education at Grand Canyon Program**

**Thursday, April 18** at Mather Campground, Sage Loop site 6: 7-9 PM – group welcome and ice breaker.

### **Day 1: Friday April 19**

8:15 Welcome by Grand Canyon National Park

Division of Science and Resource Management- Jeanne Calhoun

8:30 Grand Canyon Geology Debates and Their Global Reverberations– Dr. Karl Karlstrom, University of New Mexico

9:00 Unkar Group: summary and update- Dr. Michael Timmons, New Mexico Bureau of Geology

9:30 Chuar Group: summary and update- Dr. Carol Dehler, Utah State University

10:00 Break

10:30 Tonto Group: Summary and update- Dr. James Hagadorn, Denver Museum of Natural History

11:00 Paleozoic progress- The oldest vertebrate trackway in Grand Canyon and the dawn of reptiles: Dr. Steven Rowland, University of Nevada Las Vegas

11:30- 1:30- lunch on your own

1:30 Uplift and age of Grand Canyon and Grand Staircase- Carmen Winn, University of New Mexico

2:00 Where was the downstream end of the pre-Pliocene Colorado River- Dr. James Sears, U. Montana

2:30 Lava dams- Dr. Ryan Crow, United States Geological Survey

3:00 The Bouse connection and controversies- Dr. Phil Pearthree, Arizona Geological Survey

3:30 The shape of water- Dr. Laurie Crossey, University of New Mexico

4:00 Roaring Springs and the Pipeline- Dr. Abe Springer, Northern Arizona University

4:30 The modern river corridor and the Dam- GCMRC

### **Day 2: Saturday April 20**

8:15 Welcome by the Park

Division of Interpretation- Todd Stoeberl

8:30 Ethnogeology and Grand Canyon geoscience education- Dr. Steve Semken, Arizona State University

9:00 Engaging the Public in Geology and Geoscience: Techniques Learned Using the History of Ideas on the Origin of Grand Canyon, Wayne Ranney

9:30 Virtual field trips as a complement to field geologic learning at Grand Canyon, Tom Ruberto, Arizona State University  
10:00 Old Red and Powell's rock naming- Richard Quartaroli  
10:30 The Trail of Time Exhibit: Karl Karlstrom and Laura Crossey  
11:00 Brainstorming a next century of informal science education- panel  
11:30 Recap and organize the ToT walk- Karl Karlstrom and Laura Crossey  
12:00 -2:00- lunch on your own  
2:00-5:00 Walk the Trail of Time with geologists (in waves and small groups)

### **Introduction to the Symposium**

*Karl Karlstrom, University of New Mexico, [kek1@unm.edu](mailto:kek1@unm.edu)*

Grand Canyon rocks and landscapes provide one of the best geologic research laboratories in the world. This region has served for 150 years as a place where ideas of global importance are developed, tested, and refined. Our symposium involves active researchers who will summarize present knowledge in the context of ongoing debates and future challenges. Day 1, the geology day, will present an overview of Grand Canyon geology and discuss "hot topics" that have major importance for understanding Earth history as well as Grand Canyon geology. Day 2, the geoscience education day, emphasizes the need for continued innovations in public outreach and interpretation and a close connection between scientists and society. We will also provide geologic interpreters to walk the Trail of Time exhibit on the Rim Trail, including the originators of the exhibit. Public geoscience literacy is ever more important on our small planet of limited resources. The time perspective that geology conveys is crucial for a sustainable future as we grapple with many issues such as climate dynamism, extinctions, and resources, including water. Grand Canyon's 6 million annual visitors can play an important role internationally in gaining and promoting science literacy and geoscience awareness. A basic geology message for visitors is that Grand Canyon is a geologically young landscape being sculpted from very old rocks. Knowing some of the stories encoded in the rock layers and the landscapes enriches your experience at Grand Canyon.

