EarthScope Colorado Plateau – Rio Grande Rift Interpretive Workshop

New Mexico Museum of Natural History and Science, Albuquerque, New Mexico
October 26-28, 2009

EarthScope Interpretive Workshops: www.earthscope.org/eno/parks
This workshop information and application: www.earthscope.org/workshops/cprgr

What? EarthScope is a nationwide effort that applies the latest science and technology to explore the structure and evolution of the North American continent and understand processes that cause earthquakes and volcanic eruptions. The western United States is a prime target area for EarthScope to investigate processes that result in elevated topography, earthquakes, and volcanism. Interpretive professionals in the region of the Colorado Plateau and Rio Grande Rift have the unique opportunity to engage the public on the relevance of EarthScope discoveries as they are being made. This three-day workshop combines presentations by EarthScope scientists with interpretive methods to convey the story of how continental rifting and other processes result in the region's breathtaking landscape and geological hazards. Participants will learn how to use EarthScope data and science results, and will develop and present actual interpretive programs and exhibits during the workshop. The goal is to help interpreters create opportunities for the public to form their own intellectual and emotional connections to the dynamic landscape of the Colorado Plateau and Rio Grande Rift.

Sponsored by: EarthScope National Office and New Mexico Museum of Natural History and Science (NMMNHS – www.nmnaturalhistory.org). EarthScope (www.earthscope.org) is funded by the National Science Foundation.

Who should attend? Interpretive professionals from the National Park Service, U. S. Forest Service, Bureau of Land Management, state parks, museums, state geological surveys, and other agencies that engage the public on geological features and processes in the Colorado Plateau and Rio Grande Rift. Participants do not have to be geologists, but they should have some knowledge of the geology and tectonics of the region and experience incorporating geological information into interpretive programs or exhibits. There is also room for a few K-12 Earth science teachers who interact with interpretive specialists in parks or museums.

Funding: Participants' organizations provide travel costs to and from the workshop. The EarthScope National Office (ESNO) provides food, lodging, materials, and field trip travel while at the workshop. CDs, printed handouts, and other workshop materials will be provided by ESNO at no cost to participants.

Lodging: Rooms have been reserved at Hotel Albuquerque at Old Town (www.hotelabq.com), within walking distance of the workshop site at the New Mexico Museum of Natural History and Science. The EarthScope National Office will pay double occupancy rates for participants. Single rooms are available for participants who wish to pay ½ of the single room cost (the ESNO will pay the other half).

Commitment: Participants and instructors are required to attend the full three days of the workshop (from 10:00 AM Monday, October 26 to 4:00 PM Wednesday, October 28, 2009). Each participant and their supervisor must commit to providing follow-up training to their staff members on how EarthScope data, scientific results, and societal implications can be incorporated into interpretive programs at their site.

Instructors and Facilitators:
Bob Lillie (Professor of Geology at Oregon State University and EarthScope Education/Outreach Manager)
Jayne Aubele (Senior Educator/Geologist, New Mexico Museum of Natural History and Science)
Steve Semken (Associate Professor of Geoscience Education and Geology, Arizona State University)
Rick Aster (Professor of Geophysics and Department Chair at New Mexico Tech and Principal Investigator for EarthScope USArray Array Operations Facility and IRIS PASSCAL Instrument Center)
Henry Berglund (Graduate student at the University of Colorado and expert on GPS studies in the Rio Grande Rift)
Laurie Crossey (Professor of Geology, University of New Mexico: geoscience education, informal science education, minority participation, hydrochemistry of the western U.S.)
Karl Karlstrom (Professor of Geology, University of New Mexico: geoscience education, informal science education, tectonics of the western U.S.)
Allyson Mathis (Geologist and Science Education/Outreach Coordinator at Grand Canyon National Park)
Mousumi Roy (Associate Professor of Geophysics at the University of New Mexico and researcher of crustal deformation in the Colorado Plateau and Rio Grande Rift)

Agenda

EarthScope Colorado Plateau – Rio Grande Rift Interpretive Workshop

(Some of the presentations will be available online after the workshop)

Sunday, October 26, 2009 (Pre-workshop)

Evening:

6:00 Those arriving early are invited to the home of Laurie Crossey and Karl Karlstrom for dinner and drinks (1609 Stanford NE, Albuquerque; phone 505-239-1148 or 505-264-0483). Laurie and Karl will e-mail everyone details, including directions. Those staying at the Hotel Albuquerque can meet in the lobby at 5:30 PM to carpool.

Monday, October 26, 2009

Morning:

9:00 Instructors meet at New Mexico Museum of Natural History and Science (NMMNHS) to review workshop goals, agenda, and evaluation plan.

10:00 Participants and instructors convene at NMMNHS.

10:00 Welcoming remarks (Jane Aubele, Bob Lillie)

10:10 "Overview of the workshop and EarthScope" (Bob Lillie)

11:00 ***Brainstorming – Tangible and Intangible ideas for connecting EarthScope to the public.***

11:20 Personal Introductions

12:00 Lunch at the Museum

Afternoon:

1:00 "Tectonic history, landscape development, and water issues in the western United States" (Karl Karlstom, Laurie Crossey)

1:30 ***Brainstorming – Connections for interpreting the landscape of the western U.S. to the public.***

1:50 "USArray and other deep seismic studies of continental structure and processes in the Colorado Plateau and Rio Grande Rift" (Rick Aster)

2:20 ***Brainstorming – Connecting results of USArray to the public.***

2:40 Break.

3:00 "GPS and other geodetic monitoring of the dynamic landscape of the Colorado Plateau – Rio Grande Rift using the Plate Boundary Observatory (PBO)" (Henry Berglund and Mousumi Roy)

3:30 ***Brainstorming – Connecting results of PBO to the public.***

3:50 "Presenting EarthScope to the public in parks and museums: Interpretive themes and strategies for the Colorado Plateau and Rio Grande Rift" (Allyson Mathis)

4:40 ***Brainstorming – Combining EarthScope and interpretive methods to connect visitors to the dynamic landscape of the Colorado Plateau – Rio Grande Rift region.***

5:00 Adjourn.

6:30 Dinner (La Placita, 206 San Felipe St. NW, 505-247-2204)

(Continued next page)

Tuesday, October 27, 2009

Morning:

7:30 **Meet at NMMNHS for coffee, juice, bagels, fruit, muffins, etc.**

8:00 "Exhibits and other programming approaches in museums and science centers, including an overview of EarthScope Science Cafes in New Mexico" (Jayne Aubele)

8:30 ***Brainstorming – Ways to incorporate EarthScope observations of the dynamic landscape of the Colorado Plateau – Rio Grande Rift into museum exhibits and outreach programs.***

8:50 "Sense of place and place-based geoscience education and interpretation in the Colorado Plateau – Rio Grande Rift region" (Steve Semken)

9:20 ***Brainstorming – Using place-based informal science education to engage park and museum visitors about dynamic tectonics and landscape of the southwestern U.S., including considerations of geologic time and Earth processes.***

9:40 **Form Groups:** Begin work to develop site-specific interpretive programs that incorporate EarthScope observations in the Colorado Plateau – Rio Grande Rift region.

- Participants divide into five teams (each team has 4 to 6 participants and one scientist).
- Discuss continental rifting topics and EarthScope materials to incorporate into an interpretive program.
- Each team will come up with a skit by defining an audience, formulating tangible/intangible links, and developing a theme statement and strategy for presentation of their program.
- 15-minute programs will be presented and discussed on Wednesday.

10:00 **Field Excursion to Albuquerque Volcanoes (www.cabq.gov/openspace/volcanopark.html).**

- Involves moderate walking (light hiking boots recommended).
- Observe volcanic features and a view of the Rio Grande Rift, as highlighted in the "2009 Albuquerque Open Space Field Trip" guide by Larry Crumpler and Jayne Aubele.
- Discuss aspects of the landscape and geologic processes that can be presented to the public.
- Relate each group's interpretive theme to EarthScope observations and their bearing on continental uplift, rifting and volcanism.
- **Box lunches in the field (provided).**

Afternoon:

3:00 **Return to NMMNHS.**

3:00 ***Groups continue to develop 15-minute interpretive programs based on themes involving EarthScope and the Colorado Plateau/Rio Grande Rift region.***

5:00 **Adjourn.**

6:30 **Dinner (High Noon Restaurant & Saloon, 425 San Felipe St. NW, 505-765-1455)**

Wednesday, October 28, 2009

Morning:

7:30 **Meet at NMMNHS for coffee, juice, bagels, fruit, muffins, etc.**

8:00 "Using EarthScope data and the Active Earth Display in interpretive programs and exhibits: www.earthscope.org, www.iris.edu, and www.unavco.org." (EarthScope, IRIS, UNAVCO staff).

8:40 ***Brainstorming – Incorporating EarthScope digital resources into interpretive programs and exhibits.***

9:00 Participants present posters, exhibits, etc. from their site on Colorado Plateau – Rio Grande Rift Geology.

10:30 ***Brainstorming – How can we incorporate EarthScope into some of these exhibits?***

10:45 Break.

11:00 ***First group presentation, involving:***

- ***Theme statement, setting, audience – followed by 15-minute program presentation.***
- ***Brainstorming about geology and EarthScope content, and interpretive methods employed.***

12:00 **Lunch at the Museum**

Afternoon:

1:00 ***Continue group presentations and brainstorming after each.***

3:45 ***Workshop evaluation.***

4:00 **Adjourn.**

- Participants depart.
- Organizers and instructors meet briefly to discuss workshop and follow-up activities.

Description
EarthScope Colorado Plateau – Rio Grande Rift Interpretive Workshop

Purpose of Workshop

This is the 4th in a series of workshops organized by the EarthScope National Office (ESNO) to train interpreters[1] in parks and museums to incorporate EarthScope into programs that engage the public in landscape-forming processes and natural hazards. EarthScope employs advanced geophysical sensors and high-performance computing to measure signals generated by earthquakes and volcanic events. The program is deploying hundreds of seismometers and GPS devices, and drilling a borehole across the San Andreas Fault, to observe the inner-workings of the continent. Many of the instruments are permanently based in the western United States. Other instruments are being gradually moved across the country from west to east over the next decade. The resulting EarthScope images provide a record of how the continent has evolved over millions of years, enabling scientists, students, and the public to appreciate how the North American continent deforms in ways that affect our lives.

One of the fundamental aspects of EarthScope is the integration of many types of observations to study the structure and evolution of the continent. Two challenges facing the EarthScope community include providing the public with access to timely EarthScope science and presenting complex data and related principles in language and formats accessible to varied audiences. This workshop will show how incorporating EarthScope data and scientific results into interpretive programs and exhibits can enhance the "sense of place" represented by the dynamic landscape of the Colorado Plateau and Rio Grande Rift. Presentations and activities will focus on engaging the public on not only how and why science is important, but also that it is understandable and meaningful. The workshop will bring together individuals from the scientific and interpretive communities to learn about EarthScope and develop interpretive programs on how geophysical instrumentation enhances our understanding of landscape formation and geological hazards in a region of uplift and continental rifting in the western United States.

EarthScope Primary Interpretive Themes

Workshops were held in 2003 and 2004 to develop a comprehensive interpretive plan involving EarthScope and the National Park Service (NPS; see www.ees.nmt.edu/RME/fall2004.html). The primary interpretive themes developed in the workshops are key ideas through which EarthScope's nationally-significant values can be conveyed to the public. Two of the overall NPS/EarthScope themes are particularly applicable to interpretation in the Colorado Plateau – Rio Grande Rift region:

- ***The EarthScope experiment – the most comprehensive exploration to date of the structure, dynamics, and geologic history of the North American continent – exemplifies the insatiable human drive to learn.***
- ***EarthScope encourages a feeling of national interconnectedness – a continental sense of place – by openly inviting communities to actively participate in the experiment, and by fostering an understanding that their local environment and culture interact with other components within the larger, dynamic Earth system.***

During the Colorado Plateau – Rio Grande Rift Workshop, participants will work with scientists to develop themes specific to parks and museums in the region. By the end of the workshop, groups will develop and present interpretive programs that provide opportunities for visitors to connect EarthScope data and science to the physical and cultural aspects of their site. Here are examples of specific themes that might link EarthScope observations to dynamic Earth processes in the region:

- ***The same dynamic Earth processes that threaten our lives also nourish our spirits by creating the majestic mountains, valleys, and canyons in the Colorado Plateau and Rio Grande Rift.***
- ***Informal science education in National Parks has the potential, mostly unrealized, to reach millions of visitors with an appreciation of Earth processes and how human time scales entwine with geologic time.***
- ***Deep Earth processes, such as those monitored by EarthScope, impact society in ways that are not always understood or appreciated – they impact geological hazards and even more subtle things like water quality.***

Workshop Goals

EarthScope (www.earthscope.org) consists of three observatories: USArray, a system of seismometers managed by the Incorporated Research Institutions for Seismology (IRIS, www.iris.edu); Plate Boundary Observatory (PBO), an array of GPS, strainmeter, and other geodetic instruments managed by UNAVCO, Inc. (www.unavco.org); and San Andreas Fault Observatory at Depth (SAFOD), a deep drillhole initially managed by Stanford University (www.stanford.edu) and now UNAVCO. The goals of the Colorado Plateau – Rio Grande Rift Interpretive Workshop are consistent with those of EarthScope and these collaborative institutions.

[1] *The term "informal educator" is commonly used in museums, while parks typically use "interpreter." Other terms such as "resource educator" are used by various organizations. The term "interpreter" in this document is meant to encompass all the professionals who engage the public in informal education.*

- ***Build networks of scientists and interpreters.*** EarthScope scientists will present overviews of their research and work with participants to develop interpretive programs on uplift and continental rifting in the western United States.
- ***Produce interpretive programs and displays targeting specific audiences***. Teams of participants will work with the scientists to develop region-specific interpretive materials on earthquakes, volcanoes, and landscape development targeting visitors to parks and museums in the Colorado Plateau and Rio Grande Rift.
- ***Collaborate with EarthScope organizations to produce and disseminate data and products to interpretive professionals.*** The workshop will foster collaboration between interpreters and IRIS, UNAVCO, the U. S. Geological Survey, and other organizations to expand the EarthScope education and outreach network. Workshop products will be disseminated via print materials and the EarthScope, UNAVCO, and IRIS education and outreach web pages.
- ***Target diverse audiences to engage in interpretive programs and exhibits.*** Diverse backgrounds, learning styles and gender equity will be built explicitly into interpretive programs.

Interpretive Program Development

Participants and scientists will work in teams to assemble EarthScope and other content for interpretive programs focused on continental rifting in the Basin and Range Province and Rio Grande Rift, and evolution of the Colorado Plateau. Here are examples of three topics for interpretive programs that might be developed during the workshop.

1. ***Plate Tectonics and its bearing on Earthquakes, Volcanoes, Uplift, and other aspects of Landscape Development.*** Because of EarthScope's goal to study North America in an integrative way, interpretive programs should not "stand alone" as individual topics, but should feed into an integrative approach. This Colorado Plateau – Rio Grande Rift EarthScope program might be the "big picture" program that provides the plate-tectonic context for other programs. Interpretive opportunities will also be developed by incorporating connections of the landscape and its formation processes to the region's biology, ecology, culture, and history.
2. ***Earthquakes and other Land Movements.*** EarthScope is advancing understanding of how and why earthquakes occur by measuring small-to-moderate sized earthquakes in the region, imaging the deep structure of the crust and mantle by studying how seismic waves from distant earthquakes travel to USArray seismometers, and mapping the movement of Earth's surface with PBO strainmeters and GPS instruments. One group could develop a program emphasizing how advancement in knowledge about land movements earthquakes and other land movements impacts the safety, economy, history, and other aspects of society in the Colorado Plateau – Rio Grande Rift region and beyond.
3. ***Volcanoes.*** Ground deformation in volcanic systems measured by GPS has important implications for regional tectonics, magma recharge, and volcanic hazard mitigation. Integrating GPS observations from PBO stations and seismic data from USArray and other networks in the Colorado Plateau – Rio Grande Rift region helps us advance the science of volcano monitoring, understand factors responsible for continental rifting volcanism, and make for a safer environment for life and leisure.
4. ***Water.*** This program could examine the connections between water quality and deep Earth processes in the arid western U.S., incorporating monitoring from seismic and GPS instruments.

IRIS Active Earth Display

The Active Earth Display is an interpretive kiosk (www.iris.edu/about/ENO/aed.htm) developed by the Incorporated Research Institutions for Seismology. IRIS is the organization that deploys and maintains the seismic instrumentation for EarthScope. The kiosk includes a computer and touch-screen, and has basic modules on seismology (sample display at: www.iris.edu/activeearth/index.phtml?code=AGU2007). This material is designed to be complemented by modules focused on the region of the visitor center or museum hosting the kiosk.

Funds may be available to supply two or three sites participating in the workshop with their own Active Earth Display. The value of a kiosk, complete with computer, monitor, speakers, other electronic equipment, and housing with personalized logos, ranges from $3500 to $6000, depending on options chosen. After the workshop, participants will be invited to submit proposals outlining how they would use the kiosk to complement their overall interpretive program, and how they plan to maintain it. Sites will also be required to outline how they will help EarthScope, IRIS, and UNAVCO develop content and interpretive strategies for a Colorado Plateau – Rio Grande Rift module for the kiosk.

Earth Science Literacy Document

Many of the "Big Ideas" discussed in the workshop are part of a document on "Earth Science Literacy" recently developed by the National Science Foundation. A copy of the brochure is in the workshop binder, and can be downloaded at: www.earthscienceliteracy.org/document.html.

Instructor Bios

Dr. Richard C. Aster is Professor of Geophysics and Chair of the Department of Earth and Environmental Science at the New Mexico Institute of Mining and Technology (New Mexico Tech). His research is concentrated on volcanic, earthquake and other seismic source processes, and on using seismic data to study deep Earth structure. He is past chair of the Incorporated Research Institutions for Seismology (IRIS) Education and Outreach Standing Committee, President (2009-2011) of the Seismological Society of America (SSA), and is presently serving as a 2009 IRIS/SSA Distinguished Lecturer, presenting a talk "Taking Earth's Pulse and Temperature Using Seismology; Singing Icebergs and Roaring Oceans" for large public audiences throughout the U.S. He is also the Principal Investigator of the EarthScope Array Operations Facility and IRIS PASSCAL Instrument Center at New Mexico Tech, the principal instrumentation and support facility for global research done with temporary seismic instrumentation for researchers supported by NSF, Department of Energy, and other funding sources.

Jayne Aubele is Senior Educator/Geologist at the New Mexico Museum of Natural History and Science (NMMNHS). She has more than 25 years' experience as a research and field geologist and geoscience educator. Her research topics include Quaternary volcanism in the American southwest and volcanoes on Mars and Venus. She has a B.S. in Geology from Fenn College, an M.S. in Geology from the University of New Mexico, and an M.S. in Planetary Science from the University of Arizona. She is currently working on a Ph.D. in Geology from Lancaster University, U.K. She was a Principal Investigator on the NASA Venus Data Analysis Program and co-author of the Venus Magellan Volcano Catalog. Her extensive publications include articles and book chapters for the general public on the geology of New Mexico. Jayne has developed and presented science education programming, curricula, and materials for all age groups and for teachers of all grade levels; she is particularly interested in adult education for the general public. She is Co-PI of the NSF-funded PolarPalooza National Education Program (part of the IPY 2007-2009), and served on the EarthScope Education and Outreach Steering Committee from 2006 to 2008. Jayne was head of the Education Division for the New Mexico Museum of Natural History and Science from 1997 to 2002 and statewide Program Manager of the NASA-Rhode Island Space Grant Program from 1991 to 1996. She is currently 1st Vice Chair of the Planetary Geology Division for the Geological Society of America and past-President and current board member of the New Mexico Academy of Science.

Henry Berglund is currently a Master's candidate in the department of Geological Sciences at the University of Colorado. He grew up in Steamboat Springs, Colorado and received a B.A. in Geology from the University of Colorado. His M.S. thesis work will focus on Global Navigation Satellite Systems (GNSS) geodetic measurements of the Rio Grande Rift. During the summer of 2008 he conducted a GPS field campaign, which measured 26 points in Colorado. He currently is responsible for maintaining several GPS stations belonging to the Rio Grande Rift GPS project.

Dr. Laura Crossey is an active educator and researcher and has been a professor in Earth & Planetary Sciences at UNM since 1986. She received her PhD from the University of Wyoming in 1985, a Masters degree from Washington University (St. Louis) and a Bachelor's degree from Colorado College. She has advised over 35 undergraduate theses and 30 MS and PhD graduate students while at UNM. She served as Associate Dean for the College of Arts & Sciences at UNM for three years. She and her students investigate the intersections of hydrochemistry, tectonics and geomi-crobiology. She has also been active in obtaining funding for graduate and undergraduate training and minority participation, and currently serves as Director for the Lois Stokes Alliance for Minority Participation- Bridge to the Doctorate and Co-I of an NSF GK-12 (E&PS/Biology: Ecohy-drology of the Middle Rio Grande) working with rural middle schools in New Mexico. She was elected Fellow of the Geological Society of America in 2008. At the state level, she serves on the Governor's Math/Science Advisory Council (2007-2010), and was a member of the State Science Standards Committee, which completed the existing NM state science standards for K-12 in 2004. She is actively engaged in Geoscience outreach and informal education: with her husband, Karl Karlstrom, she is Co-investigator in an NSF funded geoscience exhibit at Grand Canyon (the Trail of Time) slated for completion next year, and has been featured in several science documentaries in 2007: "Grand Canyon" and "The Rockies" on the National Geographic channel.

Dr. Karl Karlstrom is a field-based structural geologist who has worked extensively on the tectonic evolution of western North America. He has been an active educator and researcher, and professor in Earth & Planetary Sciences at UNM for 15 years (1992-2008). Prior to that he taught at Northern Arizona University (1984-1991) and North Carolina State University (1983). He received his PhD from the University of Wyoming in 1981. He has advised 40 MS and PhD graduate students (20 at UNM) and many undergraduate theses. His recent research activities have emphasized the structure and evolution of the continental lithosphere under the Rocky Mountains and Colorado Plateau in two major multi-disciplinary experiments: Continental Dynamics of the Rocky Mountains (CD-ROM), and Colorado Rockies Experiment and Seismic Transects (CREST) experiments. He has spent several decades researching Proterozoic to Quaternary history of the Grand Canyon region. He is a founding member of the EarthScope Science and Education Committee for NSF (2002 – 2006), North American compiler for the International Geological Congress project 440- the Rodinia map project, Australian Research Council (ARC) expert of international standing, Trustee of the International Basement Tectonics Association

(2005 to present) and senior science editor for Geological Society of America Bulletin (2004-2008). He is actively engaged in Geoscience outreach and informal education: with his wife, Dr. Laurie Crossey, he is Co-investigator in a 1.8 million dollar NSF funded geoscience exhibit at Grand Canyon (the Trail of Time) slated for completion in 2010. He has been featured in several science documentaries in 2007: Fearless planet- Grand Canyon (Discovery Channel), "Naked Science- Grand Canyon" (National Geographic Channel), and "Naked Science- Rocky Mountains (National Geographic Channel).

Dr. Robert J. Lillie has been a Professor of Geology at Oregon State University since 1984, where he teaches courses in physical geology, oceanography, tectonics, geophysics, geological writing, and public interpretation. He is author of *"Parks and Plates: The Geology of Our National Parks, Monuments, and Seashores"* (W. W. Norton and Company, 2005) and is a Certified Interpretive Trainer (CIT) through the National Association for Interpretation (NAI). In 2007 he became the Manager of Education and Outreach for EarthScope. Dr. Lillie was born and raised in the Cajun Country of Louisiana. He has a B.S. in geology from the University of Louisiana – Lafayette, and an M.S. in geophysics from Oregon State University. He worked three years in oil exploration in the Rocky Mountains before earning a Ph.D. in geophysics from Cornell University, where he processed and interpreted deep-crustal seismic reflection data with the COCORP project. Dr. Lillie's research is focused on the crustal structure and tectonic evolution of mountain ranges formed by the collision of continents, including the Himalayas in India and Pakistan and the Carpathians in Central Europe. He is also author of *"Whole Earth Geophysics: An Introductory Textbook for Geologists and Geophysicists"* (Prentice Hall, 1999), used in college courses in the U. S. and other countries. Since 1994 Dr. Lillie has collaborated with the National Park Service (NPS) on educating the public in geology. He has been a seasonal interpretive ranger at Crater Lake and Yellowstone national parks and John Day Fossil Beds National Monument, and he and his graduate students have written and illustrated geology training manuals for several NPS sites. Dr. Lillie has presented seasonal training on geology at many parks, as well as workshops at annual NAI meetings. At the 2005 Geological Society of America meeting, Dr. Lillie was presented an award from the NSP Geological Resources Division for "outstanding contributions in engaging the National Parks staff and visitors in geoscience." Dr. Lillie has done numerous bicycle tours of the U.S., Ireland, the Alps, Central Europe, and Scandinavia, and he is an accomplished photographer and Cajun cook.

Allyson Mathis is the Science and Education Outreach Coordinator for the Division of Science and Resource Management at Grand Canyon National Park. She grew up in Florida and received a B.S. in Geology from the University of North Carolina, Chapel Hill, and M.S. in geology from Oregon State University. Her M.S. thesis focused on the volcanic history of the Basin and Range Province in southeastern Oregon. Allyson has worked for the National Park Service (NPS) since 1991 as an interpretive ranger at Canyonlands and Capitol Reef National Parks in Utah, Capulin Volcano National Monument in New Mexico, and Grand Canyon National Park in Arizona. She is the author of "Grand Canyon: A Yardstick of Geologic Time" published in 2006 by the Grand Canyon Association. She is an NPS interpretive trainer and has presented many training sessions on interpretive methods and techniques to convey geological features and processes to the public. Allyson was a co-instructor of the EarthScope Workshop for Interpretive Professionals in the Basin and Range Province held in Reno, Nevada in October, 2008, as well as a workshop training scientists on interpretive methods at the 2009 EarthScope National Meeting in Boise, Idaho. Her professional interests include science education, the interpretation of geology, and helping the public become stewards of the national parks.

Dr Mousumi Roy is an Associate Professor in the Department of Earth and Planetary Sciences at the University of New Mexico. She received her PhD in Geophysics from the Massachusetts Institute of Technology in1997. Dr. Roy's research interests involve geodynamic modeling of lithospheric deformation at plate boundaries and within plate interiors. Her current projects include testing a new model of the Tertiary evolution of the Colorado Plateau based on constraints from magmatic patterns, xenoliths, geologic, and geophysical data, and an integrated study of exhumation and erosion using low-temperature thermochronology and geodynamic models of the Colorado Plateau. She is involved in EarthScope projects on seismic anisotropy in the western United States, as well as GPS investigations of crustal deformation in the Rio Grande Rift.

Dr. Steven Semken is an Associate Professor of Geoscience Education and Geological Sciences in the School of Earth and Space Exploration at Arizona State University. He is a geoscience education researcher and ethnogeologist who works at the intersection of Earth science with cognitive science and human geography. He studies cognitive, affective, and cultural influences on geoscience learning, with the objective of better engaging the diverse communities of the southwestern United States in the Earth and space sciences. Dr. Semken and his students are currently conducting research on effective leverage of sense of place in geoscience teaching; application of ethnogeologic concepts from American Indian and Latino cultures in place-based curricula; strategic K-12 science teacher recruitment, preparation, and retention; and cognition in informal geoscience learning at Grand Canyon (Trail of Time Project) and other southwestern National Parks. Dr. Semken has a S.B. in Earth and Planetary Sciences from MIT, an M.S. in Geochemistry from UCLA, and a Ph.D. in Materials Science from MIT. He taught at Diné College (the tribal college of the Navajo Nation) from 1988 to 2003, before joining the ASU faculty, and has worked extensively with Native American schools and communities across the greater Southwest. Dr. Semken is a Past-President and former Distinguished Speaker of the National Association of Geoscience Teachers.

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Workshop Funding, Lodging, and Food

Through a grant from the National Science Foundation, the EarthScope National Office (ESNO) will pay shared-room lodging, meals, workshop materials, and field trip costs for all participants. Participants must arrange and pay for their own travel to and from the workshop.

Lodging:

A block of rooms has been set aside at the Hotel Albuquerque at Old Town, within walking distance of the workshop site (New Mexico Museum of Natural History and Science). ESNO will pay double occupancy rates for participants. Single rooms are available for participants who wish to pay ½ of the single room cost (the ESNO will pay the other half). **Either way, you do not need to book your own reservations.**

On applying online for the workshop, please indicate the dates you'll need lodging (Oct. 25, 26, 27) and if you wish a single room. (Note that, with a starting time of 10:00 AM on Monday, Oct. 26, some participants may wish to travel directly to the workshop site that morning). **The ESNO will make the reservations for you and pay the hotel directly. Those requesting single rooms will pay their half of the room cost on checkout.**

Hotel Albuquerque at Old Town
800 Rio Grande Blvd. NW
Albuquerque, NM 87104
Phone: (505)-843-6300; Fax: (505)-842-8426
Front Desk: 1-800-237-2133; Reservations: 1-866-505-7829
E-mail: hotelabq@hhandr.com; Web: www.hotelabq.com

Food:

Snacks & Lunches. ESNO will provide free coffee/tea/soft drinks/snacks and lunches at the workshop site on Monday, Tuesday, and Wednesday. A free continental breakfast will be provided at the workshop site on Tuesday and Wednesday starting at 7:30 AM.

Dinners. ESNO will pay for dinners on Monday and Tuesday evenings (participants and instructors pay for their own drinks).

Monday, October 26, 6:30 PM:
La Placita
208 San Felipe St. NW
Albuquerque, NM, 87104
Phone: (505)-247-2204
Web: www.laplacitadiningroom.com/index.html

Tuesday, October 27, 6:30 PM:
High Noon Restaurant & Saloon
425 San Felipe St. NW
Albuquerque, NM, 87104
Phone: (505)-765-1455
Web: www.itsalwayshighnoon.com

Further Information:

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