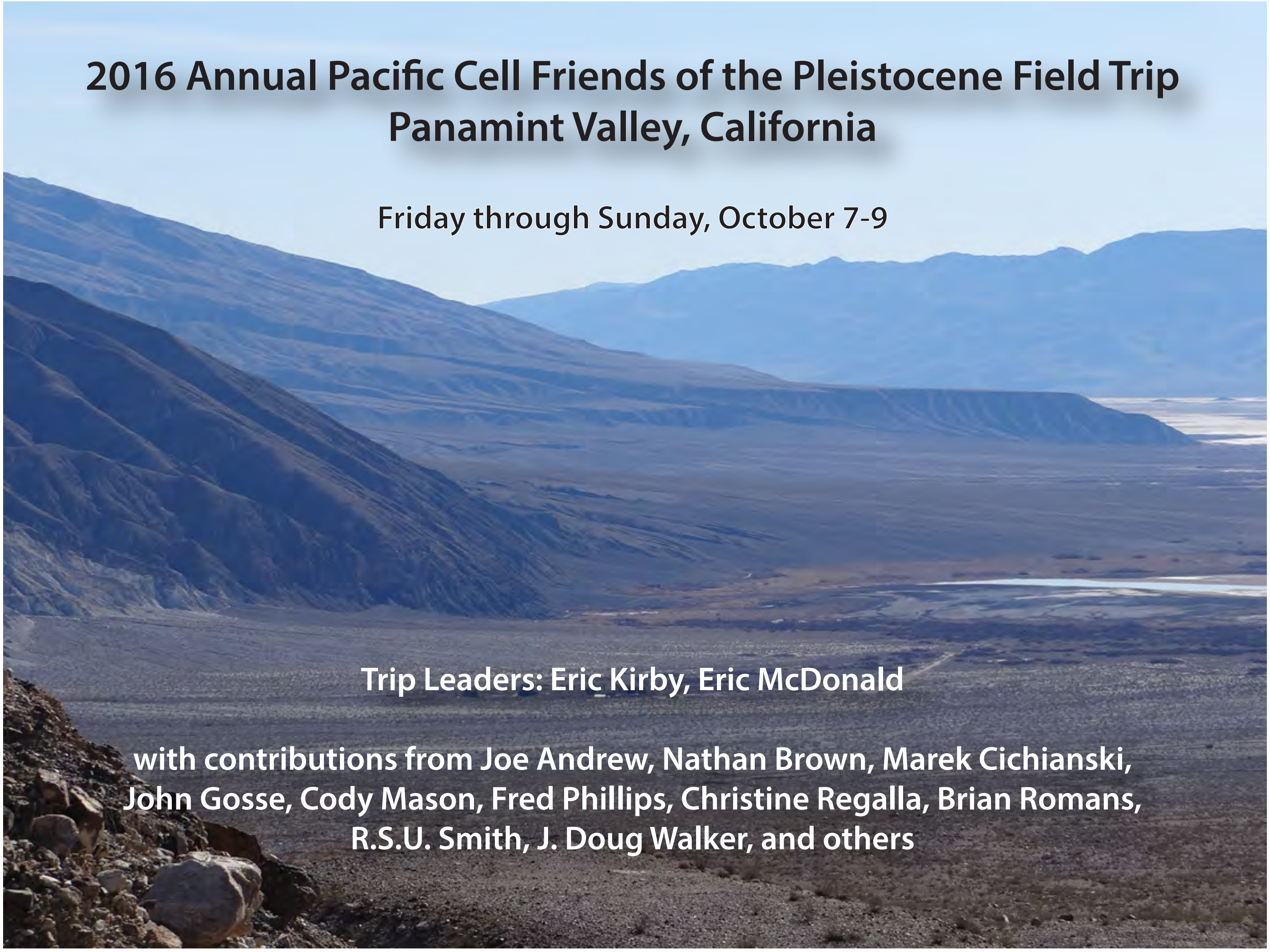


We are pleased to announce that the 2016 Annual Pacific Cell FOP field trip will be held in Panamint Valley, CA, Friday through Sunday, October 7-9.

**THE ESSENTIALS:**

Registration, travel and camping information can be found on at the FOP web site (here). Registration fees ($30 professionals, $20 students) go toward portable toilets, refreshments, and t-shirts for all. Although you may opt to register upon arrival, please do so in advance if at all possible, as it helps with planning (and guarantees that we have a t-shirt in your size).

**MOTIVATION:**

Panamint Valley is a tectonically active, pull-apart basin located within the Eastern California - Walker Lane shear zone (Burchfiel and Stewart, 1966). Despite spectacular exposures of alluvial and lacustrine stratigraphy that record a complex interplay between fault slip and basin subsidence, hydrologic fluctuations, and variations in sediment supply, the basin has received relatively limited study. Underscoring this, the last FOP in the valley was organized in 1978 by R.S.U. Smith. A brief reference list is included on the last page.

For the better part of a decade, have been working on a number of interrelated questions regarding the alluvial and lacustrine history of the young valley fill, the nature of slip along active faults in the valley, and the degree of soil development as a function of time. Although we do not intend to create a comprehensive field guide to the entire valley, we hope to address aspects of the following outstanding issues:

1. ***What is the nature of slip along the range-bounding fault system?*** Opening of the modern Panamint Valley fault system is argued to have occurred along a low-angle (<15°), oblique-slip normal fault that is linked to the dextral Hunter Mountain fault (Burchfiel et al. 1987; MIT and Biehler, 1987; Jones and Wesnousky, 1984). In contrast, Pleistocene slip along the active strands of the southern Panamint Valley fault system appears to be primarily right-lateral (Smith, 1979; Zhang et al., 1990). Low-angle detachments involving Plio-Quaternary deposits are present within the Panamint Range (Cichanski, 2000; Walker et al., 2005; Numelin et al., 2007; Andrew and Walker, 2009), but whether these participate in the active deformation field remains debated. We will present arguments from field observations that suggest to us that low-angle normal faults are not only active along much of the range front, but that these ruptured in prehistoric paleoseismic events.

2. ***What was the timing, duration, and extent of lakes in Panamint Valley during the late Pleistocene?*** The timing of lacustrine occupation of Panamint Valley has been a long-standing question in the hydrologic history of the eastern Sierra (Gale, 1914; Smith, 1976; Fitzpatrick and Bischoff, 1993; Fitzpatrick et al., 1993; Jayko et al., 2008). High shorelines attest to an extensive lake that filled most of the valley to a depth of several hundred meters (Smith, 1976), but the age of this system has been difficult to determine, with estimates ranging from ~70 ka to ~150 ka. We will present new age data from $^{10}$Be and $^{36}$Cl depth profiles, optically stimulated luminescence (OSL) and soil stratigraphy on beach ridges that argue for the younger side of this range (MIS 4 - 5a). We will also address a second debate, over the extent of the most recent (MIS 2) lake in Panamint Valley (Jayko et al., 2008). Dating and mapping of deposits and landforms associated with this period along the eastern foot of the Panamint Range suggest a relatively small and short-lived lake ~20-30 m depth.

3. ***What are the primary rates and processes of soil development in the valley?*** Much of our work has relied on soil development as a means to associate alluvial and lacustrine deposits of different age, landscape position, and source lithology. We have developed a relatively extensive data set of well-charaterized soils (many associated with dated deposits). We will discuss the utility of using this chronosequence as a tool to help understand both the timing of episodes of alluvial fan development and the history of fault displacement. Examples will focus on soil stratigraphy associated with a widespread pulse of fan aggradation subsequent to lake occupation at 60-80 ka, and on Holocene ruptures along both the range front fault and the Ash Hill fault (e.g., Densmore and Anderson, 1997).

## SELECTED REFERENCES


Andrew, J.E., and Walker, J.D., 2009, Reconstructing late Cenozoic deformation in central Panamint Valley, California: Evolution of slip partitioning in the Walker Lane: Geosphere, v. 5, no. 3, p. 172–198.

Burchfiel, B.C., Hodges, K.V., and Royden, L.H., 1987, Geology of Panamint Valley - Saline Valley Pull-Apart System, California: Palinspastic evidence for low-angle geometry of a Neogene Range-Bounding Fault: Journal of Geophysical Research: Solid Earth, v. 92, p. 10422–10426.

Burchfiel, B.C., and Stewart, J.H., 1966, "Pull-Apart" Origin of the Central Segment of Death Valley, California: Geological Society of America Bulletin, v. 77, no. 4, p. 439–442.

Cichanski, M., 2000, Low-angle, range-flank faults in the Panamint, Inyo, and Slate ranges, California; implications for recent tectonics of the Death Valley region, Geological Society of America Bulletin, v. 112, p. 871-883.

Densmore, A. L., and Anderson, R.S., 1997, Tectonic geomorphology of the Ash Hill Fault, Panamint Valley, California, Basin Research, v. 9, p. 53-63.

Fitzpatrick, J.A., and Bischoff, J.L., 1993, Uranium-Series Dates on Sediments of the High Shoreline of Panamint Valley, California: U.S. Geological Survey Open-File Report 93-0232, 15 p.

Fitzpatrick, J.A., Bischoff, J.L., and Smith, G.I., 1993, Uranium-Series Analyses of Evaporites from the 1000-Foot PAN-3 Core, Panamint Valley, California: U.S. Geological Survey Open-File Report 93-558, 22 p.

Gale, H.S., 1914, Salines in the Owens, Searles, and Panamint basins, southeastern California, US Geological Survey Bulletin, v. 580, p. 281-323.

Jayko, A.S., Forester, R.M., Kaufman, D.S., Phillips, F.M., Yount, J.C., McGeehin, J., and Mahan, S.A., 2008, Late Pleistocene lakes and wetlands, Panamint Valley, Inyo County, California, in Reheis, M.C., Hershler, R., and Miller, D.M., eds., Late Cenozoic Drainage History of the Southwestern Great Basin and Lower Colorado River Region: Geologic and Biotic Perspectives: Geological Society of America Special Paper 439, p. 151–184, doi: 10.1130/2008.2439(07).

Lee, J., Stockli, D.F., Owen, L.A., Finkel, R.C., and Kislitsyn, R., 2009, Exhumation of the Inyo Mountains, California: Implications for the timing of extension along the western boundary of the Basin and Range Province and distribution of dextral fault slip rates across the eastern California shear zone: Tectonics, v. 28, no. 1, doi: 10.1029/2008TC002295.

MIT, F.C.G., and Biehler, S., 1987, A geophysical investigation of the Northern Panamint Valley, Inyo County, California: Evidence for possible low-angle normal faulting at shallow depth in the crust: Journal of Geophysical Research: Solid Earth, v. 92, p. 10427–10441, doi: 10.1029/JB092iB10p10427.

Numelin, T., Marone, C., and Kirby, E., 2007, Frictional properties of natural fault gouge from a low-angle normal fault, Panamint Valley, California: Tectonics, v. 26, doi: 10.1029/2005TC001916.

Oswald, J.A., and Wesnousky, S.G., 2002, Neotectonics and Quaternary geology of the Hunter Mountain fault zone and Saline Valley region, southeastern California: Geomorphology, v. 42, p. 255–278.

Smith, R. S. U., 1976, Late Quaternary pluvial and tectonic history of Panamint Valley, Inyo and San Bernardino counties, California, PhD thesis, 295 pp, California Institute of Technology, Pasadena.

Smith, R.S.U., 1978, Pluvial History of Panamint Valley, California: Pacific Cell, Friends of the Pleistocene, Guidebook, 36 p.

Smith, R.S.U., 1979, Holocene offset and seismicity along the Panamint Valley fault zone, western Basin-and-Range Province, California: Tectonophysics, v. 52, p. 411–415.

Walker, J.D., Kirby, E., and Andrew, J.E., 2005, Strain transfer and partitioning between the Panamint Valley, Searles Valley, and Ash Hill fault zones, California: Geosphere, v. 1, no. 3, p. 111–118, doi: 10.1130/GES00014.1.

Wesnousky, S.G., and Jones, C.H., 1994, Oblique slip, slip partitioning, spatial and temporal changes in the regional stress field, and the relative strength of active faults in the Basin and Range, western United States: Geology, v. 22, p. 1031-1034.

Zhang, P., Ellis, M., Slemmons, D.B., and Mao, F., 1990, Right-lateral displacements and the Holocene slip rate associated with prehistoric earthquakes along the Southern Panamint Valley Fault Zone: Implications for southern Basin and Range tectonics and Coastal California deformation: Journal of Geophysical Research: Solid Earth, v. 95, p. 4857–4872.