

Rutgers Earth and Planetary Sciences (EPS) Book Cliffs, UT Field Trip, May 31-June 6, 2017

Rutgers EPS Professors Ken Miller and Greg Mountain led 15 graduate students (including student collaborators from Haifa and Dalhousie Universities) on an exploration of the Book Cliffs of Utah and other geological highlights in the Helper/Price, Green River, and Moab areas. We explored “The Birthplace”, not of football but of outcrop sequence and parasequence stratigraphy, pioneered in the 1980’s and 1990’s by Exxon Production Research Company. Following in the footsteps of two previous EPS-Chevron trips led by the late Bryan Bracken of Chevron, on day 1 we entered the “Gates” guarded by the 79-77 Million year old Castlegate Formation and did a brief overview of Utah geology and the Book Cliffs at the overlook in Helper, Utah. On day 2, we introduced the students to outcrops of shoreface systems and parasequences at Gentile Wash and fluvial systems of the Castlegate Formation near Helper. To even seasoned geologists, encountering rocks like these in outcrop brought to life all the scholarship of studying these same features in textbooks and isolated laboratories. Gentile Wash provided a Rosetta Stone for Day 3 to invade Tuscher Canyon and place these features into a sequence stratigraphic context. Day 4 was the test: students poured over the rocks to decipher the decidedly more complex sequence stratigraphy at Thompson Canyon. Several new discoveries by the students (including the exposure surface of a major sequence boundary by Guy Lang from Haifa and a fossiliferous lagoon/estuarine fill by Rutgers’ Kristin Joyse) led to an afternoon discussion parsing the sequence stratigraphy and comparing our findings with previous Exxon, and Rutgers/Chevron interpretations. This was the “graduation day” for now seasoned sequence stratigraphers, followed by a quick look at tidalites in the Sego Formation and an unexpected 16-mile wild ride through the top of the cliffs. Day 5 was the “fun” day: we did an overview of the Permian-Jurassic stratigraphy of Canyonlands National Park, followed by evaluation of the distortions of this stratigraphy at the structure at Upheaval Dome. Is it a pinched salt diapir, or considering the central uplift and convoluted distortions, is it an impact, as suggest by shocked quartz reported from the rim? This was followed by a tour of the Moab Fault which turned into an unexpected climb of the fault and of Arches National Park, where the Arches are mostly held up by contorted beds of the Carmel Formation. Are these latter beds a seismite deposit representing the smoking gun of the Upheaval Dome impact? We hiked 5 miles in 100°F weather in Woodside Canyon on Day 5, finally convincing ourselves that a sequence

boundary is incised into a remarkable marine shoreface system. The return to the airport on Day 6 allowed only a brief stop at the cyclically bedded Eocene Green River Formation lake deposits and the “fanglomerates” of the proximal Maastrichtian-Paleocene North Horn Formation that resemble New Jersey’s own “Pebble Bluff” conglomerates. Graduate students JN Stanley and Luca Podrecca drove 2200 miles to bring the EPS van and needed equipment to Salt Lake City and helped keep us on track as we explored wild back country.

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