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Letter to Prospective Graduate Students 2021-2022,

Thank you for your interest in our program! I hope that you take the time to check out some of the projects and links associated with my research group. My colleagues and I in Earth & Planetary Sciences, Biology and Civil Engineering departments are working on some terrific projects.

My research emphasis is on the interaction between water and Earth materials, including biogeochemical interactions. These interests have taken me to the experimental laboratory, sedimentary core repositories from Denver CO, Ames IA, and Bakersfield CA to Canberra, Australia; modern sedimentary geochemistry settings in the Rio Grande rift, Jemez Mtns, and San Juan basin, NM, Lechuguilla Cave in Carlsbad Caverns, NM, the Australian Mound Springs of the Simpson Desert; the oases and travertines in the Western U.S. (including Grand Canyon), the Western Desert of Egypt; geothermal springs of the Himalayan region (Tibet), and the sedimentary geologic record in Creede CO (Tertiary), the San Juan Basin NM (Cretaceous and Jurassic), and Proterozoic sequences of the Grand Canyon AZ, Uinta Mtns UT, and Death Valley CA. I also examine these phenomenon from a planetary perspective in impact crater settings, and more recently as a Mars Science Laboratory (MSL) Science Team Collaborator working with Curiosity on the ChemCam team.

In addition to basic research, I am involved in many research and outreach activities at Grand Canyon, entailing action-packed trips (raft-based) on the Colorado River--- lots of opportunities for student participation! I am currently fascinated by spring and travertine deposits (ancient and modern) in arid settings, especially the western U.S., with a major focus on the Rio Grande Rift, the Grand Canyon/Colorado Plateau, and Colorado's Rocky Mountains. Whether you're in a modern stream bed, an arid soil, or deep in a sedimentary basin, the presence of water, minerals and microbes ensures that action is underway... Neil Young said it succinctly: "Rust Never Sleeps". My students obtain broad practical experience generally in aqueous geochemistry/water quality/geomicrobiology [developing skills such as from installing and monitoring wells with autonomous sensors to geochemical analysis and modelling (major ion chemistry, field parameters, trace element and stable isotope geochemistry,)] and more recently, gas chemistry; more rock-oriented students focus on sedimentary geochemistry/ diagenesis through standard petrographic analysis and application of analytical tools such as the scanning electron microscope, x-ray diffractometer, electron microprobe, stable isotope mass spectrometry, and radiogenic isotope analyses (including Sr87/86, U-series geochronology, and noble gases). Students take advantage of our many first-rate analytical laboratories, as well as interacting with colleagues elsewhere. We also work closely with colleagues in the Center for Water and the Environment as well as UNM's Masters of Water Resources program.

I am also involved with a number of science education projects. I am part of a sustained effort to provide a comprehensive geoscience interpretation for Grand Canyon (with UNM's Karl Karlstrom and others) through construction of the Trail of Time at the South Rim (Trail of Time). Karl and I also work with GCNP on their recent new visitor center film and newer web pages and upcoming Apps! Some of the recent projects are listed in the publications portion of my UNM home page.

As examples of the range of research topics, recent contracts and grants include:

"US Egypt Cooperative Research: Comparisons between New Mexico and Egyptian travertines and tufas": NSF OISE (10/01/2010-9/30/2012)

"Climate change impacts on New Mexico's mountain sources of water (water quality)": NSF EPSCoR (9/01/2008 – 8/31/2011); w/C. Dahm, Biology

"Continental Smokers: evaluating mantle degassing, CO2 flux, geomicrobiology, and water quality in extensional continental regimes"; NSF EAR-Hydrologic Sciences, 1/1/2009-12/31/2012; w/K. Karlstrom, C. Vesbach & D. Northup (Bio)

"Biogenic cave carbonates: Identifying surface carbon input to subsurface ecosystems": NSF Geochem Program (w/Diana Northup and Leslie Melim)

"CO₂ springs and travertines of the southwestern U.S.: Hydrologic pathways linking tectonism and water quality": NSF Hydrologic Sciences Program (01/01/2006-12/31/2008), w/ K. Karlstrom & T. Fischer

"Track 1, GK-12: Ecohydrogeology in the Middle Rio Grande Environment"; NSF/EHR; S. Collins (Biology Dept., UNM) and L. Crossey.

"Geomicrobial Interactions of Microbial Communities in Cave Deep Subsurface Environments: A Novel Extreme Environment" with Clifford Dahm and Diana Northup (UNM Biology), and Mike Spilde (Institute of Meteoritics), NSF Life in Extreme Environments (LexEn) Program

"Dissected hydrologic system at Grand Canyon: interaction between upper and lower world waters in modern springs and ancient travertines" with Karl Karlstrom & Tobias Fischer, NSF Hydrologic Sciences Program

"Identification of Microbial Signatures in Biogenic Cave Ferromanganese Deposits" with Diana Northup, Mike Spilde, Cliff Dahm, and Penny Boston (NMT), NSF Biological Sciences Division

Collaborative Research: The age of Grand Canyon: applying new tests to resolve the 150-year-old debate: NSF Tectonics.

Collaborative research: Reconstructing the Origins of the Colorado River: An Integrative Study of the Miocene-Pliocene Bouse Formation UNM PI L.J. Crossey and co-PI K.E. Karlstrom with lead PI B. Dorsey (U. Oregon) and A. Cohen (U. Arizona); NSF Sedimentary Geology Program.

Spring Inventory on the Cibola NF, P.I. L. Crossey, Co-I. B. Bixby, Biol; USDA/US Forest Service; 9/1/2016-08/31/2021.

Post-Fire Fen Evolution Effects on Stream Water Quality, PI Crossey; NPS Co-operative Agreement; 06/15/2016 - 12/31/2017.

Collaborative Research: A Strategic Partnership for Geoscience Education and Research on Watershed Science and Climate Change in the Southwestern U.S., PI Stone (UNM CE); co-PI Crossey; NSF HRD; 10/1/2016- 9/30/2021.

Collaborative research: Helium-isotope systematics along seismic profiles in Tibet to study geometry of Indian and Tibetan lithosphere beneath the Lhasa and Qiangtang terranes, (Collaborative with Klempner at Stanford), UNM PI is Laura Crossey; Karlstrom is UNM co- PI; To: NSF-EAR: UNM portion is \$94,566.

Long-term dynamics of stream hydrology and water quality in the Jemez Mountains of New Mexico. US NPS Cooperative Agreement P17AC01318. 5/1/2018-9/30/2020.

New Mexico Alliance for Minority Participation (STEM Pathways & Alliances): NSF HRD, P.I. P. King, NMSU, Co-I L. Crossey, NSF 09/1/18-08/31/23.

Boron and Ribose in Clay: a Precursor for Life on Earth & Mars? (Project #20190238ER), P.I. Patrick Gasda (LANL), Co-I L. Crossey, LANL 10/01/2018-09/30/2021.

Graduate students since 2000 include:

Deb Bergfeld (PhD, 2001; co-advised with Fraser Goff of LANL), Susan Block (MS, Dec. 2002), David Vinson (MS, Dec. 2002), Ron Amato (MS, 2004; Water Resources Program), Tom Loveland (MS, 2004), Armand Groffman (PhD, 2002), James Dyer (MS, 2006; Water Resources Program), Barton Faulkner (PhD, 2006; co-advised with Michael Campana) and Dennis Newell (PhD, 2007; co-advised with Zach Sharp). Matthew Kirk (PhD 2008). Eileen Embid completed an M.S. on travertines of the Springerville volcanic field in 2009. Jan Curtis finished her MS in the Water Resources Program on water quality in Bluewater Creek of the Zuni Mountains also in 2009. Amy Williams completed her MS looking at water quality in the Rio Grande rift at the Sevilleta LTER site with a focus on the influence of saline springs. Jessica Lopez-Pearce completed an MS on the paleohydrology of the Hualapai Limestone in Arizona. Zabe Premo completed her MS on the groundwater biogeochemistry in southeastern NM at Bitter Lakes. Ara Kooser completed his MS looking at the geochemistry and geomicrobiology of cave pool precipitates in Carlsbad and Lechuguilla caves, NM. Brandi Cron completed an MS linking microbial processes in terrestrial CO₂-rich springs and marine vent systems. April Tafoya completed her MS on travertine and groundwater connections in the Jemez mountains, NM. Lauren Sherson finished her MS involving surface water quality and groundwater/surface water interactions in the Valles Caldera. Gloria Jimenez completed her MS on travertine and paleoclimate connections in the Western Desert of Egypt. Alexandra Priewisch completed her PhD on major travertine occurrences throughout NM and AZ. Becky Frus completed her PhD focusing on spring water quality and sustainability in Cibola National Forest watersheds in NM. Pavel Vakhlamov completed an MS on water quality in the Gila river system in southwestern NM. Valerie Blomgren completed an MS on deep fluids in northern NM. Jared Smith finished his MS measuring CO₂ flux across faults to investigate fault permeability. Christina Ferguson completed an MS on the Neogene Bouse deposits of the Lower Colorado river. Jon Golla completed his MS thesis on geothermal geochemical modelling and the influence of geothermal waters on surface water quality in the

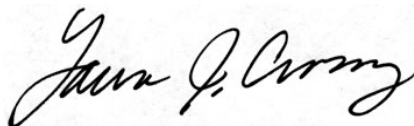
Jemez Mountains. Christopher McGibbon completed his MS and is working on a PhD evaluating the influence of deep fluids and fault/tectonic connections on surface waters in northern NM and Grand Canyon. Current MS students include Naomi DeLay (working on springs and post-fire effects on water quality in the Manzano Mountains), Brionna O'Connor (working on Grand Canyon surface water/groundwater interactions in Grand Canyon), Daniel Lavery (working on water quality in NM systems), and Kambray Townsend (working on springs and water quality in NM).

I work closely with a number of other graduate students when their projects intersect my research interests. I also work with many undergraduate students on senior thesis projects. Though students work on individual projects, the Diagenesis group collaborates on field and analytical efforts when possible. Weekly research meetings with colleagues within EPS, Civil Engineering and Biology are often a component of the program. I am involved in joint research with the Center for Water and the Environment (<https://cwe.unm.edu/>), and co-lead UNM's Grand Challenge effort in Sustainable Water Resources ([UNMSustainableWater](https://unmsustainablewater.org/)).

A recent effort with Scott Collins in Biology involved working with graduate student Fellows in middle schools in Socorro, Belen and Laguna Pueblo (E-MRGE: Ecohydrogeology of the Middle Rio Grande- a GK-12 Fellow Program). I am also the Institutional Coordinator for the UNM Louis Stokes Alliance for Minority Participation (LS-AMP) and former Director for the AMP Bridge to the Doctorate: both programs provide opportunities for eligible minority students. I am also a key participant in the development of a large exhibit at Grand Canyon National Park, The Trail of Time at Grand Canyon. It opened in October 2010 and there is still more to do! (<https://www.nps.gov/grca/planyourvisit/the-trail-of-time.htm>)

I teach graduate courses in the Geochemistry of Natural Waters, Geomicrobiology, and Advanced Environmental Science. I also teach Introductory and Historical Geology. I am currently the Department undergraduate Honors advisor. I was honored to be selected as the 2019 Birdsall-Dreiss Distinguished Lecturer in Hydrology... perhaps I saw you while I was on tour in 2019! If you would like further information, please email me at lcrossey@unm.edu.

Thanks again for your interest!

A handwritten signature in black ink, reading "Laura J. Crossey". The signature is written in a cursive, flowing style.

Laura J. Crossey, Distinguished Professor