New Mexico Underground: Spectacular Subsurface Systems for Interdisciplinary Science and Exploration

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In New Mexico, we enjoy many magnificent landscapes and varieties of geology and wildlife. But beneath our feet, there is a wondrous hidden wilderness that few people experience other than possibly via trips to Carlsbad Caverns National Park or the lava caves at El Malpais National Monument. Our state is graced by a wide variety of subsurface terrains with distinct geological settings, origin mechanisms, mineralogy, microbiology, and wildlife. Functioning as integrated systems, subsurface cavities and associated rock fracture networks are a significant part of hydrological systems, and even possess their own micrometeorological behavior. Although beneath the surface, caves are significantly coupled to the surface by both matter and energy exchanges making them an important part of Earth’s Critical Zone (CZ). This was defined in a landmark National Research Council study (2001) as the heterogenous, surface and near subsurface environment of rock, soil, water, air, and biota that engage in complex interactions that regulate natural habitats, thus determining access to resources that sustain life including our own.

The fundamental nature of geology and geochemistry combined with surface climate over time has produced each cave, and governs its resulting structural and mineralogical properties. Cave minerals worldwide currently number more than 300, many of which are found only in caves, and some of which are found only in a single cave (White 2016; Hill & Forti, 1997). And this tally does not include many unusual organic minerals produced in caves with bat, bird, and other biological organic contributors.

Microorganisms and some larger organisms act as geological agents further helping to catalyze, enhance, transform, and even sometimes impede the geological processes of cave systems. Thus, in order to truly understand the subterranean realm, an integrated interdisciplinary approach involving all of the relevant natural sciences is essential. This understanding is further enhanced by the paleontological and anthropological materials contained within many cave systems that often preserve these finds in exquisite condition.

As an example of a highly successful interdisciplinary approach, a mere 1½ hours drive east of Socorro is Ft. Stanton Cave, which has been known and used by Native Americans, white settlers, and today for recreational cave trips. In 2001, Ft. Stanton yielded a new secret buried at her heart...a gleaming “frozen” river of crystalline calcite in a previously unknown passage, Snowy River. In the 20 years since elapsed, extensive work has been carried out by many explorers, mappers, diggers, scientists, cartographers, photographers, and others (FSCSP 2017).

I will present a handful of examples of the diverse cave systems in New Mexico, a summary of their most striking properties, and pose scientific questions that often cross-cut all of these systems in our community’s efforts to understand them.

References:


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