CYANOBACTERIA SOIL CRUST AND ENDOLITHS AT BARRINGER METEORITE CRATER (aka METEOR CRATER), ARIZONA. David A. Kring, Lunar and Planetary Institute, Universities Space Research Association, 3600 Bay Area Blvd., Houston TX 77058 (kring@lpi.usra.edu).

Introduction: The Barringer Meteorite Crater (aka Meteor Crater) is a well-known geologic analogue for simple craters on Mars and elsewhere in the Solar System. It also hosts a large variety of ecological niches that may provide biologic analogues, too.

Several biological stories at the crater have been previously uncovered: paleo-environmental conditions at the time of impact have been ascertained, as have biological opportunities created in a post-impact lacustrine environment (see Chapters 13 and 14 in [1] and references therein). Local atmospheric conditions in the crater also affect the physical state of potential habitats. A meteorological experiment suggests that cold air may pond on crater floors, which would deepen thermal inversions seen in Mars' craters [2]. Downslope winds may also enhance ablation of volatiles from bedrock, caves, and talus on crater walls, plus debris in gullies (see Chapter 16 in [1]).

Today, Barringer Meteorite Crater is occupied by several biozones [3,4]. It is dominated by a grassland community, but also hosts a small woodland of two-needle piñon and juniper. Both those communities are underlain by wildflowers and succulents. Here I introduce two additional communities.

Cyanobacteria Soil Crust: The crater hosts cyanobacteria that is best seen on the crater floor (**Fig. 1**). It forms a biological soil crust. Strings of cyanobacteria or filaments are wrapped around mineral particles, binding the soil together. The crust stabilizes the soil against wind and water erosion. The crust also acts like a sponge, soaking up rain in the typically arid environment and, over a longer time, releasing it.

Endoliths: The crater hosts an endolithic community of species not yet determined, but potentially involving cyanobacteria, too. The organisms form a band beneath a thin crust as seen in ejected crater rim rock (**Fig. 2**). Bands of this type have been seen in the High Arctic's Haughton crater [5] and in Antarctica's Ross Desert [6]. The endoliths at Barringer Meteorite Crater appear to include a photosynthetic species – due to its location and color. Previous work suggests [7] this type of endolithic niche is attractive in hot and cold desert environments with large temperature ranges, low water availability, and high-intensity ultraviolet radiation. Those are the types of conditions found at Barringer Meteorite Crater.

Conclusions: Microorganisms utilize at least two strategies, in two different ecological niches, at Barringer Meteorite Crater. One community occupies the crater floor, while the other occupies the crater rim. Both strategies accommodate arid environmental conditions and a mile-high elevation where ultraviolet radiation sensitivity may be an issue.

Figure 1. *Cyanobacteria soil crust on crater floor.*

Figure 2. *Green-colored endolithic colony exposed when a sandy dolomite was chipped.*

References: [1] Kring D. A. (2017) *Guidebook to the Geology of Barringer Meteorite Crater, Arizona (aka Meteor Crater).* Second Edition, LPI Contribution No. 2040, 272p. [2] Smith M. D. et al. (2004) *Science, 306*, 1750–1752. [3] Kring D. A. (1997) *Meteoritics & Planet. Sci., 32*, 517–530. [4] Kring D. A. (2003) *Wildflower 19(4)*, 16–17 & 29. [5] Cockell C. S. et al. (2002) *Meteoritics & Planet. Sci., 37*, 1287–1298. [6] Niemow J. A. et al. (1988) *Microb. Ecol., 16*, 271–289. [7] Pontefract A. et al. (2014) *Astrobiology, 14*, 522–533.