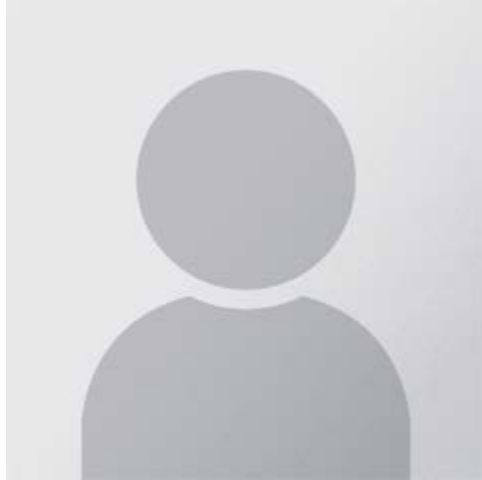


2006 State NMJAS Paper Competition Winner

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Environmental Engineering of Pogonomyrex Harvester Ant Mounds

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Abstract: In the area around White Rock Canyon, New Mexico, harvester ants cover their mounds with small quartz crystals. This project addresses the effects of these actions on the temperature and humidity inside the mounds, in an attempt to understand the cause of this behavior. My hypothesis is that the ants cover their mounds with quartz rocks to regulate the temperature and humidity within the mounds. My procedure for studying the effects of covering ant mounds with quartz crystals includes the following. I observe ant behavior outside mound as a function of time during the day, while simultaneously measuring the air temperature, the surface ground temperature, the temperature beneath the ground, and the temperature within the mound for several neighboring mounds. I also directly measure the temperature as a function of time during the day and night of two model mounds, one covered with quartz crystals and one made without quartz crystals. I make simultaneous measurements of the air and ground temperatures. I also studied the retention of water within the two model ant hills, with and without quartz, as a function of time. I find that ant activity (both number of ants and distance from mound) correlates with surface temperature, with activity peaking around $T=95$ F and no activity for $T>115$ F. Ant mounds consist of small rocks to dirt in a 2:1 ratio and ants actively carry small rocks to mounds. The ants carry rocks to their mounds from as far away as 50 feet. These rocks make it easier for the ants to rearrange tunnels within their mound. The presence of quartz rocks increases the temperature in the mound by an average of 2.5 ± 0.5 F compared to the mound without quartz, a small but consistent effect. The quartz rocks also increase the amount of moisture retained by -50% and increase the time that moisture is retained by -66%. In summary, harvester ants have successfully controlled their environment by simple quartz engineering.