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OCCURRENCES OF ORBICULAR GRANITE IN NEW MEXICO

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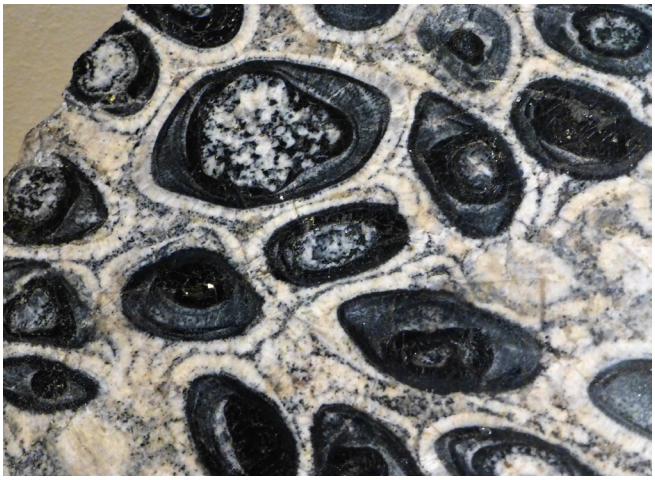
Orbicular Rocks are an uncommon rock type occurring across the globe. They are nonsedimentary rocks which contain spherical or roughly spherical nodules, called orbicules, which generally present concentric layering of contrasting texture and mineralogy. Although commonly known as orbicular granites, such orbs can occur in all types of plutonic rocks from granitic to mafic, ultramafic and carbonatite rocks. They can also occur in metamorphic and migmatitic rocks. The most common origin theory has the orbicules formed through concentric nucleation of mineral layers around a mineral grain due to physical changes within a magma chamber. This origin theory is commonly embedded in the definition of an orbicular rock. However, there are other theories of origin of orbicular rocks and it is likely that no one common origin can explain all the structures in all the occurrences.

New Mexico contains occurrences of orbicular rock in two principal locations, the Sandia Mountains and the Zuni Mountains. They appear to have dramatically different origins and are unrelated to each other. The Sandia Mountain orbicules formed within a more traditional plutonic regime. In simplified terms, the host rock is Sandia granite and granodiorite with the orbs having the concentric layering of the traditional definition of orbicular texture. The two small occurrences within the Sandia granite present somewhat differently, but the basic concept is maintained. Enz et al. (1979) describes how changes in temperature, pressure, composition, and water-enrichment, as well as physical movement, within a magma chamber could result in the concentric layering of mineralogy as well as physical deformation that is common within the Sandia orbicules.

Polished sections of orbicular rocks from the Sandia Mountain La Luz Trail site show the multiple layers of plagioclase and biotite with nucleation cores of various types as described by Affholter and Lambert (1982) within a host rock of Sandia granite. Sections from the Sandia Mountain Tijeras Canyon site show a single thick shell of white plagioclase and 1 – 3 shells of intergrown salmon-colored microcline perthite and quartz.



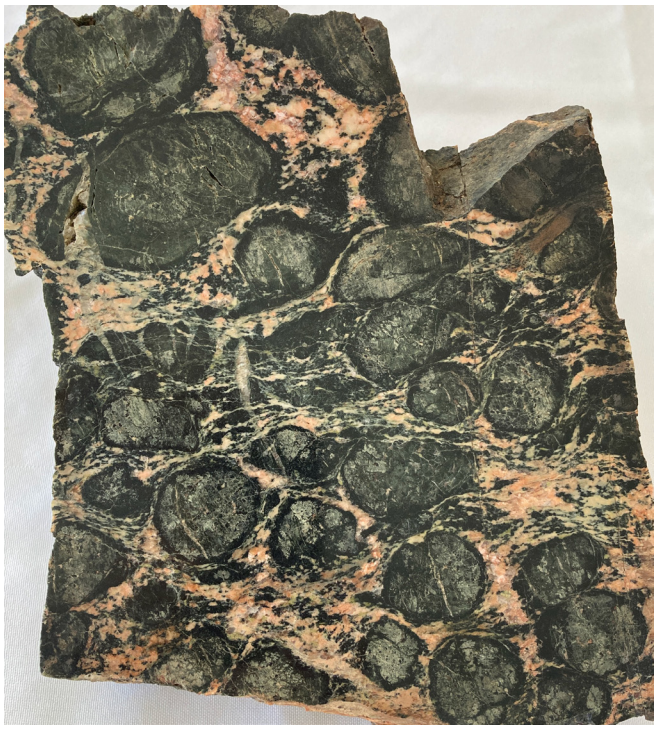
North Sandia Orbicular Granite

South Sandia Orbicular Granite

In contrast with the Sandia sites, the Zuni Mountain orbicular rocks are found within a metamorphic regime. The two small outcrops occur in gneissic quartz monzonite near the contact with quartz-feldspar gneiss. Metamorphosed ultramafic rocks and ultramafic breccias also occur as xenoliths within the monzonite.

Specimens of Zuni orbicular rocks present a very different appearance than that of the traditional definition of orbicular rocks. Within a pink granitic matrix, dark green orbs consist primarily of amphibole, having no concentric internal structure and no core. The texture of the orbs is very striking, in that plate-shaped individual crystals of amphibole overlap each other in a helical pattern from the center of each orb to the edge (Lambert, 1982). The orbs frequently fall out of the matrix, leaving a thin shell of the amphibole within the resulting cavity.

Lambert (1982) proposes that the Zuni orbicules were formed from intrusion of gneissic quartz monzonite into ultramafic bodies. At a distance from the intrusive contact the ultramafics



Zuni Mountains Orbicular Granite

were brecciated; closest to the contact, where the amount of monzonite and the heat were greatest, the breccia fragments reacted with the monzonite to form the orbicules.

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