INTRODUCTORY REMARKS

This year's field trip will highlight rhyolitic volcanism in the Mogollon-Datil Volcanic field of southwestern New Mexico. This volcanic field is roughly mid-Tertiary in age (between about 40 Ma and 20 Ma). It covers an area of about 40,000 km^2 and has a volume of about 10,000 km^3. In a phrase, 1T'S BIG.

The volcanic field includes rocks that range from basalt through andesite and dacite to rhyolite in composition. Perhaps the most outstanding volcanic features are about a dozen calderas and the ash-flow tuffs that were erupted from the caldera areas. Although they vary somewhat in size, a "typical" caldera is about 20-30 km wide, and formed by collapse that occurred in response to the geologically instantaneous eruption of a large volume of magma that gave rise to a rhyolite ash-flow tuff. There are about twice as many ash-flow tuffs as calderas, which suggests that the "typical" caldera went through two cycles of eruption and collapse. Some of the geologic evidence is too incomplete and muddled to be more specific about detailed correlations between calderas and ash flows, although a paper by Ratte and others and another by McIntosh and others provide many suggestions for correlations.

The rhyolite that is the focus of the field trip is the Taylor Creek Rhyolite. The rhyolite consists of at least 20 lava domes and associated pyroclastic deposits. These rocks are distributed over an area roughly equal to the size of a typical caldera. Though some of the evidence is equivocal, the domes and pyroclastics apparently were emplaced during twenty eruptions that occurred in a very short period of time.... so short that all probably were fed from a single large magma reservoir. One of the outstanding problems associated with the Taylor Creek Rhyolite is understanding why this magma reservoir did not erupt violently to form an ash-flow tuff and caldera pair, whereas the dozen or so surrounding magma reservoirs, some a bit older and some younger, did so.

Remember that rhyolite is the most viscous in the spectrum of magma types. Rhyolite also commonly contains more dissolved volatiles (mostly H_20) than the other magma types. It's principally the process of volatile escape that controls how violent the eruption of magma of any composition is. With an abundance of volatile material that has a difficult time escaping because of high magma viscosity, rhyolite tends to produce the most violent eruptions.

The Taylor Creek Rhyolite is an exception to this "rhyolite rule", apparently because it had an unusually low H_20 content, about 2 wt% versus 5-6 wt% typical of most rhyolites. The Taylor Creek Rhyolite magma was also somewhat unusual because it contained around ten times more fluorine (F) and several times more tin than most other rhyolite magmas. Fluorine is considered a volatile constituent in magma, but it tends to stay dissolved in a magma as confining pressure is reduced, unlike H_20, which preferentially exsolves and thus gives rise to violent eruptions. The unusually high F in Taylor Creek Rhyolite is expressed through the presence of topaz, a F-bearing mineral. Unfortunately, we won't be able to visit a topaz locality in the brief time we have for the field trip. High tin content is expressed through the presence of scattered cassiterite-bearing veinlets. Cassiterite is tin dioxide, and we should have at least one chance to collect cassiterite samples. Some other interesting and semi-unique chemical aspects of the Taylor Creek Rhyolite will be explained during the field trip.

We will also examine some of the physical aspects of the emplacement and growth of rhyolite lava domes. A typical Taylor Creek Rhyolite dome grew by inflation of a fluid magma core that caused a cool, solid and therefore brittle outer rind to fracture into a breccia during the inflation. We will have a chance to see the rhyolite "carapace breccia" at the leading edge of one dome and at the bottom of another. We will also see exposures of the cores of domes, the parts that remained fluid during dome growth. These "core" rocks are pretty massive, coherent flow-foliated lavas. The flow foliation is locally deformed into bizarre fold patterns.

ALONG THE WAY

There are several points of interest along our route between Flagstaff and the Taylor Creek area. Between Saint Johns and Springerville (pretty close to Springerville) the highway crosses a couple of Quaternary basalt lava flows of the Springerville Volcanic Field. There are many older (Tertiary) basaltic lava flows along the highway east from Springerville and we can see a vertical basalt dike in a road cut just west of Pietown. Some silicic pyroclastic and water-reworked pyroclastic deposits are present near the town of Datil. About 10 miles east of Datil the highway passes through the VERY LARGE ARRAY (VLA), a group of large dish antennas on tracks to permit various configurations for "listening" to the "sounds" of deep space. We hope to be able to tour this facility. We will go about 50 miles south from the VLA on a dirt road that winds through various volcanic units of the Mogollon-Datil Volcanic Field, until we reach the Taylor Creek Rhyolite and our camp site along the creek that is the namesake for the rock.