



# PETROLOGY OF PROTEROZOIC TO TERTIARY ROCKS IN THE SOUTHERN BURRO MOUNTAINS, NM: INSIGHTS INTO MAZATZAL TO BASIN AND RANGE MAGMATISM AND TECTONICS

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## ABSTRACT

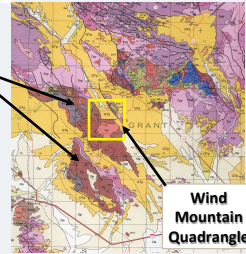
Analysis of thin sections from the Wind Mountain quadrangle, Burro Mountains, NM, near the Tyrone copper mine, reveals a complex geologic history. Rock samples collected in the study area were cut using a rock saw and thin sections were prepared and analyzed to determine mineral content and fabric patterns. The oldest rocks in the study area are strongly metamorphosed and locally mylonitized Proterozoic quartzofeldspathic gneisses and amphibolites of Mazatzal affinity. Mineralogical indications of shearing correlate with shear zones observed during field mapping in the area. Another set of samples are of younger Proterozoic granites and metagranites that intruded the country rock. This suite of granites is probably part of the 1.5 byo Burro Mountain granite. In addition to the ductile rocks, several thin sections were of mineralized fault breccia with abundant hydrothermal calcite and, in some samples, gozzan zone iron. Another group of thin sections were of unmetamorphosed mafic dikes rocks composed mostly of pyroxene (augite) and plagioclase. The youngest rocks studied were thin sections of Tertiary tuffs and flows. This study helps with understanding the magmatic, deformational and hydrothermal alteration history of an economically important area.

## STUDY AREA

Colors show rock units.

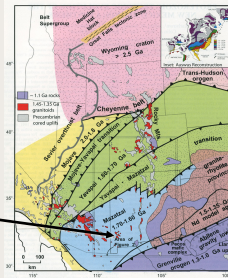
### Burro Mountains

25 rock samples were collected from the western half of the Wind Mountain quadrangle, in Grant county New Mexico.



## TECTONIC OVERVIEW

The Wind Mountain quadrangle is located entirely within the Mazatzal province, one of several Precambrian orogenic belts in the southwest United States. The Mazatzal orogeny resulted in the accretion of 1.67-1.65 Ga crust to the southern part of Laurentia (proto North America). The new crust of the Mazatzal province, along with the other Archean to Proterozoic age provinces spanning the southern United States, was added in long, northeast-trending accretionary belts. These belts were made primarily of juvenile continental rocks from volcanic arcs and get younger toward the southeast.



### Burro Mountains in the Mazatzal Province

## METHODOLOGY



This project required that microscope "thin sections" be made from the rock samples collected by Dr. Barker in the study area in previous years. This entailed using a rock saw to cut small rectangular pieces of the rocks, called billets, that could then be sent away to be professionally manufactured into a microscope slide. When cutting billets from hand samples collected in the field, the objective is to maximize the usefulness of each thin section by carefully orienting the section surface. Ideally, the thin section should be representative of the hand sample, and display structural features as clearly as possible.

(Left): The author demonstrates proper safety precautions for handling a rock saw.



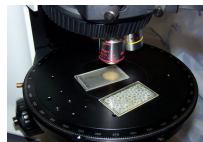
Samples are collected in the field.



They are then marked and cut using a rock saw.

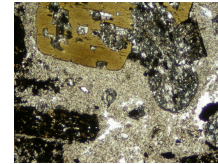
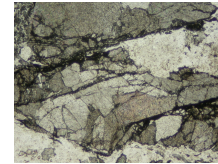
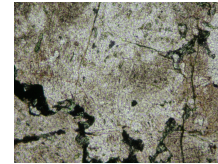
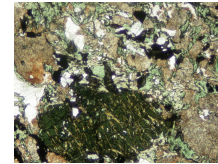
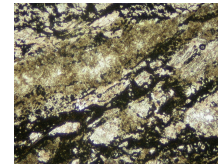
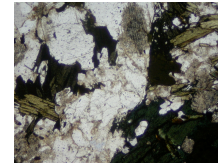
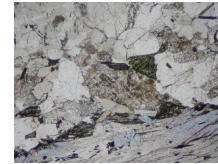


The cut billets are prepared and sent away.

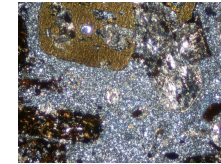
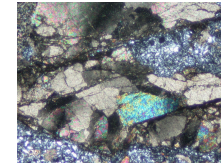
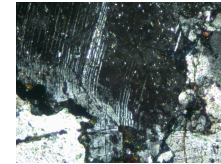
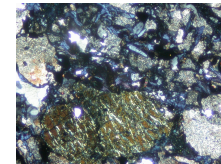
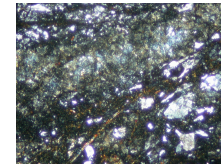
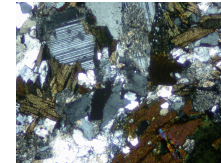
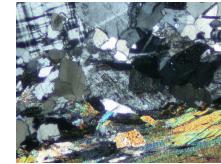


Thin section slides are analyzed using a petrographic microscope.

BELOW ARE SOME OF THE SAMPLES PHOTOGRAPHED IN PLANE POLARIZED LIGHT:



BELOW ARE THE SAMPLES PHOTOGRAPHED IN CROSSED POLARIZED LIGHT:



## ANALYSIS AND INTERPRETATION

### "Spotted" Schist:

Paleoproterozoic metasedimentary rock. Strongly foliated, this felsic schist consists mostly of quartz and feldspar, with some microcline, which is visible in the bottom right corner of the view.

### Metagranite:

Part of a group of mesoproterozoic granites and metagranites with mafic dikes. Shows weak foliation if any, with quartz, hornblende, feldspar with albite twinning, and biotite.

### Variably Deformed Metagranite:

(next 3 sets of photographs show the same thin section)

This view shows the top edge of the thin section, adjacent to a fault plane and displaying strong foliation. The rock grades downward from the fault plane into undeformed metagranite (below).

Same section, viewed farther away from the fault plane. Weakly foliated if at all. Abundant chlorite is light green in plane light and bright blue under crossed poles. A large, dark green hornblende grain has quartz inclusions. Feldspars are light brown.

Same section, view of a feldspar grain with albite twinning at a higher magnification. Under crossed poles, shearing and micro-offset of twin lamellae is visible.

### Calcite-rich Fault Breccia:

This hydrothermal breccia is cemented with large grains of calcite. Small quartz grains have an interlocking pattern possibly due to metamorphism, hydrothermal alteration, and/or fracturing. Source of calcite may be erosion of Mesozoic and Paleozoic limestones.

### Rhyolite to Andesite Porphyry:

Most likely a Tertiary intrusive dike or flow, this sample has a fine matrix of quartz and feldspar, with large grains of hornblende, biotite, and partially zoned plagioclase. Some grains have an iron-oxide coating, which may be indicative of hydrothermal activity.

## ACKNOWLEDGMENTS

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