# A LENSOIDAL RHYOLITE NEAR TWIN BUTTES, ARIZONA

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Pectinate (or axiolitic) structure is remarkably well-developed in a volcanic rock at the southeast end of the Sierrita Mountains, Pima County, Arizona. The host rock, a lensoidal rhyolite, is one unit of a series of sedimentary and volcanic formations. In the immediate area about 1,000 feet of the Cretaceous(?) section can be subdivided into six members (Fig. 1). Only the upper two are of concern here.

## PETROGRAPHY

The lensoidal rhyolite and an underlying black welded tuff have a gradational contact and may be considered broadly to be textural facies of one unit.

Black welded tuff*--The welded tuff is dark gray to black and glassy or greasy-lustered. Distorted dark fragments averaging an inch in diameter and having white rims are common. Microscopically it is crystalline but plane polarized light reveals a densely matted structure resulting from welding of what were probably once viscous shreds of melt.

A specimen from the core of an anticline at the west (Fig. 2) consists of fragments of devitrified glass, tuff, and partly disaggregated sandstone. In addition it contains angular fragments of quartz and feldspar. The groundmass is presumed to be mostly quartz and feldspar. The only other phases are opaque trichites and margarites which probably account for the dark color of the hand specimens.

Lensoidal rhyolite--The lensoidal rhyolite is gray, tan, white, pink, or purple and porcelaneous in texture. It is always hard and little affected by weathering. Some rock lacks foliation but nevertheless contains the peculiar wreathed inclusions that elsewhere are streaked out to extreme lengths. Subangular feldspar and quartz crystals and lithic fragments are not uncommon.

In thin section the microcrystalline groundmass is sharply bounded from the lenses. It contains one or two percent of magnetite and the rest is quartz and feldspar partly altered to clay. Locally, the welded structure is recognizable but usually the granular, microcrystalline assemblage has

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* The term welded tuff is used here as a structural term with no genetic connotation.

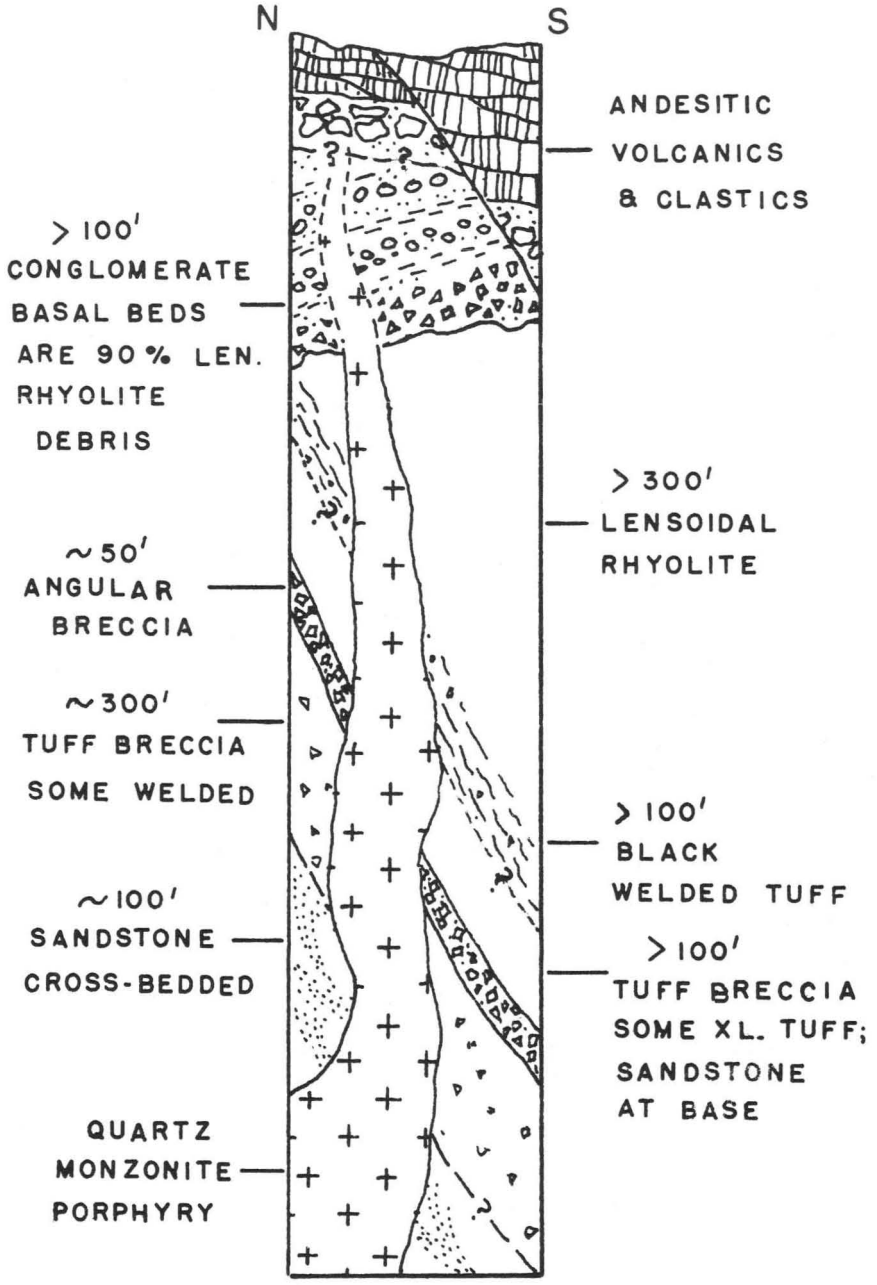


Figure 1. --Schematic columnar section.

obliterated it. Some of the groundmass is highly foliated and optically oriented.

The typical lens averages about half an inch in the intermediate dimension and major-minor dimensional ratios vary from 1:1 to over 50:1. Lineation is not common. Although some lenses with feldspar laths as much as 2 mm in length reveal the internal structure to the unaided eye, one usually must rely on the microscope for examination.

Under the microscope the structure is seen to be a zonal arrangement of a polycrystalline quartz center surrounded by a border of euhedral orthoclase projecting inward from a feathery crystalline zone at the edge of the lens. Where plagioclase is present, it is as subhedral crystals along with perthitic orthoclase isolated in the quartz center. Locally spherulites of orthoclase with well-developed crystals at the periphery are present in the core. Elsewhere in the large lenses the entire field of the microscope can be filled with an assemblage that resembles a fine-grained granite; the plagioclase is never zoned and there are no mafic minerals except for rare magnetite grains.

Quantitative measurements were made on unstained and stained thin sections and with reflected light on stained slab surfaces. Slabs were stained by a procedure modified from one developed by Bazeley and Jestes (personal communication). HF was applied directly to the slab but allowed to remain only 15 seconds. Sodium cobaltinitrite solution was left on the etched surface about 3 minutes. Results on thin sections were disappointing. Fortunately the slabs can quickly be reground and stained again until an even degree of staining is obtained. The results in Table 1 are considered reliable. They show that lenses occupy from one third to one quarter of the rock. These data must be qualified by the possibility that in selecting specimens in the field, I picked lensoidal samples and thus overweighted the importance of the lenses. Lenses are very high in orthoclase, moderately high in quartz, and low in plagioclase (oligoclase). The perthitic nature of the orthoclase suggests that more plagioclase may remain "hidden" as a submicroscopic exsolute in the orthoclase. The composition, then, is probably rhyolitic and it is considered to represent the whole rock.

Relic banding that is identifiable as that of collapsed pumice is noted in some axiolites. The transformation of such plastic fragments must have occurred at high viscosity and may even have been more properly, devitrification.

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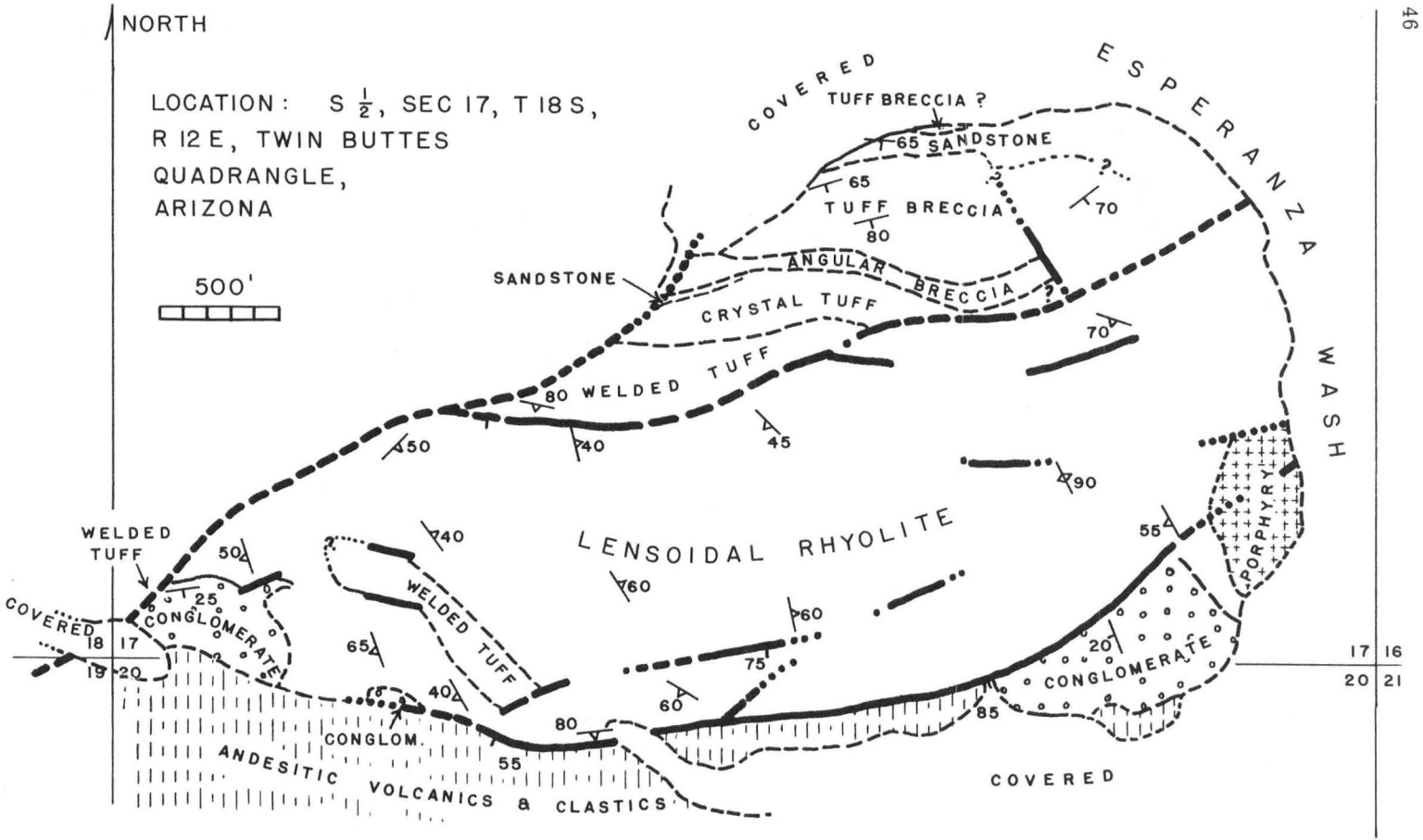
NORTH
LOCATION: S ½, SEC 17, T 18 S, R 12 E, TWIN BUTTES QUADRANGLE, ARIZONA
500'
COVERED
TUFF BRECCIA ?
65 SANDSTONE
65
TUFF BRECCIA
80
70
ESPERANZA WASH
SANDSTONE
ANGULAR BRECCIA
CRYSTAL TUFF
70
80 WELDED TUFF
50
40
45
90
WELDED TUFF
50
LENSOIDAL RHYOLITE
40
60
55
PORPHYRY
WELDED TUFF
25
CONGLOMERATE
COVERED
18
17
19
20
65
40
60
75
60
20
CONGLOMERATE
17
16
20
21
CONGLOM.
80
55
85
ANDESITIC VOLCANICS & CLASTICS
COVERED

Figure 2.

TABLE 1
MODAL ANALYSES OF LENSOIDAL RHYOLITE

| Specimen number | Lenses | | | | Groundmass | | Quartz-sericite alteration | |
|---|---|---|---|---|---|---|---|---|
| | Quartz | Ortho-clase | Plagio. | Total | Fine | Coarse | | |
| E-5 | 10.6 (38.5) | 15.3 (54.7) | 1.9 (6.8) | 27.8 (100.0) | 72.2 | - | - | stained slab surfaces |
| E-8 | 10.4 (31.0) | 19.6 (60.2) | 2.8 (8.8) | 32.8 (100.0) | 66.8 | 0.4 K-felds. crystal | - | |
| E-13 | 7.6 (30.8) | 16.6 (67.2) | 0.5 (2.0) | 24.7 (100.0) | 72.3 | 0.3 plagio. crystal | 2.7 | |
| E-4 | 12.2 (34.7) | 21.1 (60.3) | 1.7 (5.0) | 34.0 (100.0) | 63.5 | 0.1 magnetite crystal | 1.4 | |
| E-10 | 7.8 (29.0) | 17.1 (63.3) | 2.1 (7.7) | 27.0 (100.0) | 69.3 | 0.1 quartz crystal | 3.6 | unstained thin sections |
| E-3(?) | 9.9 (33.4) | 17.6 (59.3) | 2.2 (7.3) | 29.7 (100.0) | 65.6 | 0.3 K-felds. crystal | 4.4 | |
| E-3 may actually be E-8 | | | | | | | | |
| E-14 | 4.4 (19.7) | 17.6 (78.7) | 0.4 (1.6) | 22.4 (100.0) | 72.5 | 0.4 plag., ortho., and qtz. crystals | 4.7 | |