THE GEOLOGY OF PICKETPOST MOUNTAIN, NORTHEAST PINAL COUNTY, ARIZONA*

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INTRODUCTION

Picketpost Mountain is a prominent local landmark about 4 miles southwest of Superior, Pinal County, Arizona (Fig. 1). It is a butte-shaped

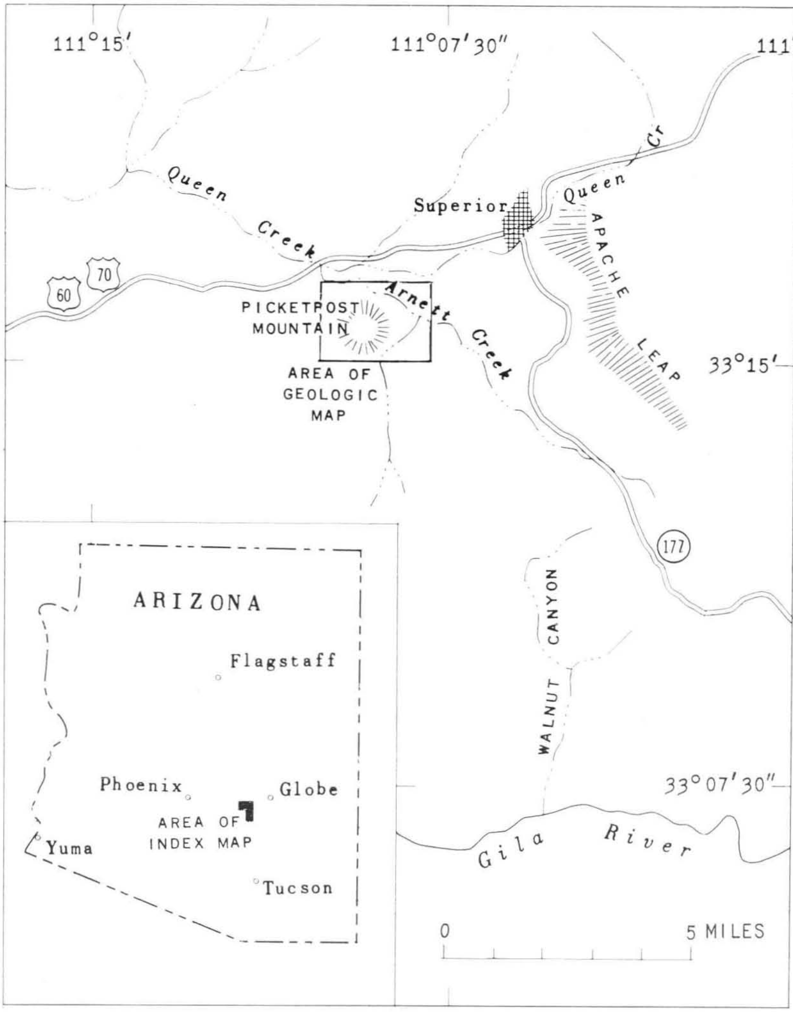

FIGURE 1. Index map.

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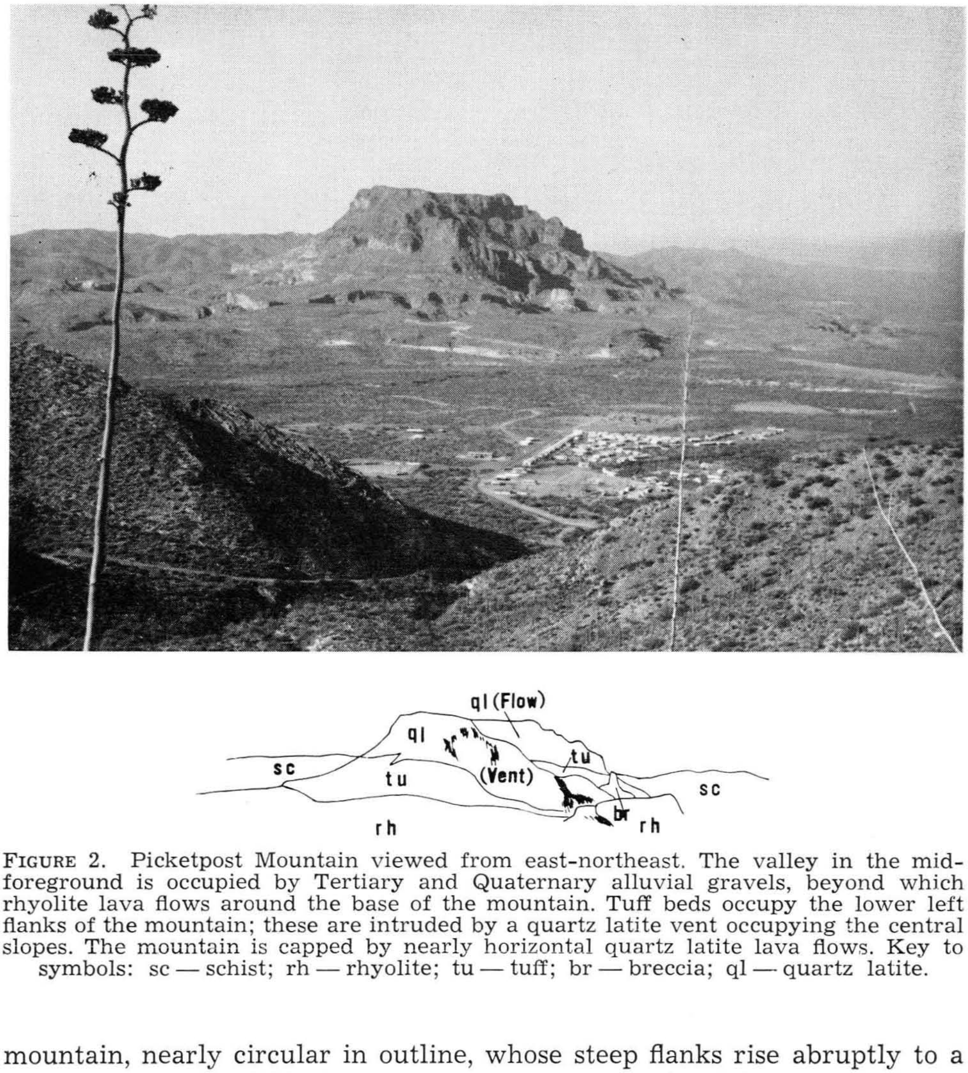

FIGURE 2. Picketpost Mountain viewed from east-northeast. The valley in the mid-foreground is occupied by Tertiary and Quaternary alluvial gravels, beyond which rhyolite lava flows around the base of the mountain. Tuff beds occupy the lower left flanks of the mountain; these are intruded by a quartz latite vent occupying the central slopes. The mountain is capped by nearly horizontal quartz latite lava flows. Key to symbols: sc — schist; rh — rhyolite; tu — tuff; br — breccia; ql — quartz latite.

mountain, nearly circular in outline, whose steep flanks rise abruptly to a flat top (Figs. 2 and 3). The summit of the mountain at 4,375 feet is from 1,500 to 2,000 feet higher than the surrounding area.

The area shown in Figure 4 was mapped in 1955, and further investigations were made in 1961. The area was studied chiefly to determine the relations between the volcanic rocks on Picketpost Mountain and the dacitic ash-flow sheet widely exposed in the Globe-Superior area.

I would like to acknowledge stimulating discussions with Donald F. Hammer of the Magma Copper Co., Superior, on the geological problems of this area. Donald C. Lamb of the University of Cincinnati, who has been studying the area to the south, has pointed out geologic relations important in developing some of the conclusions.

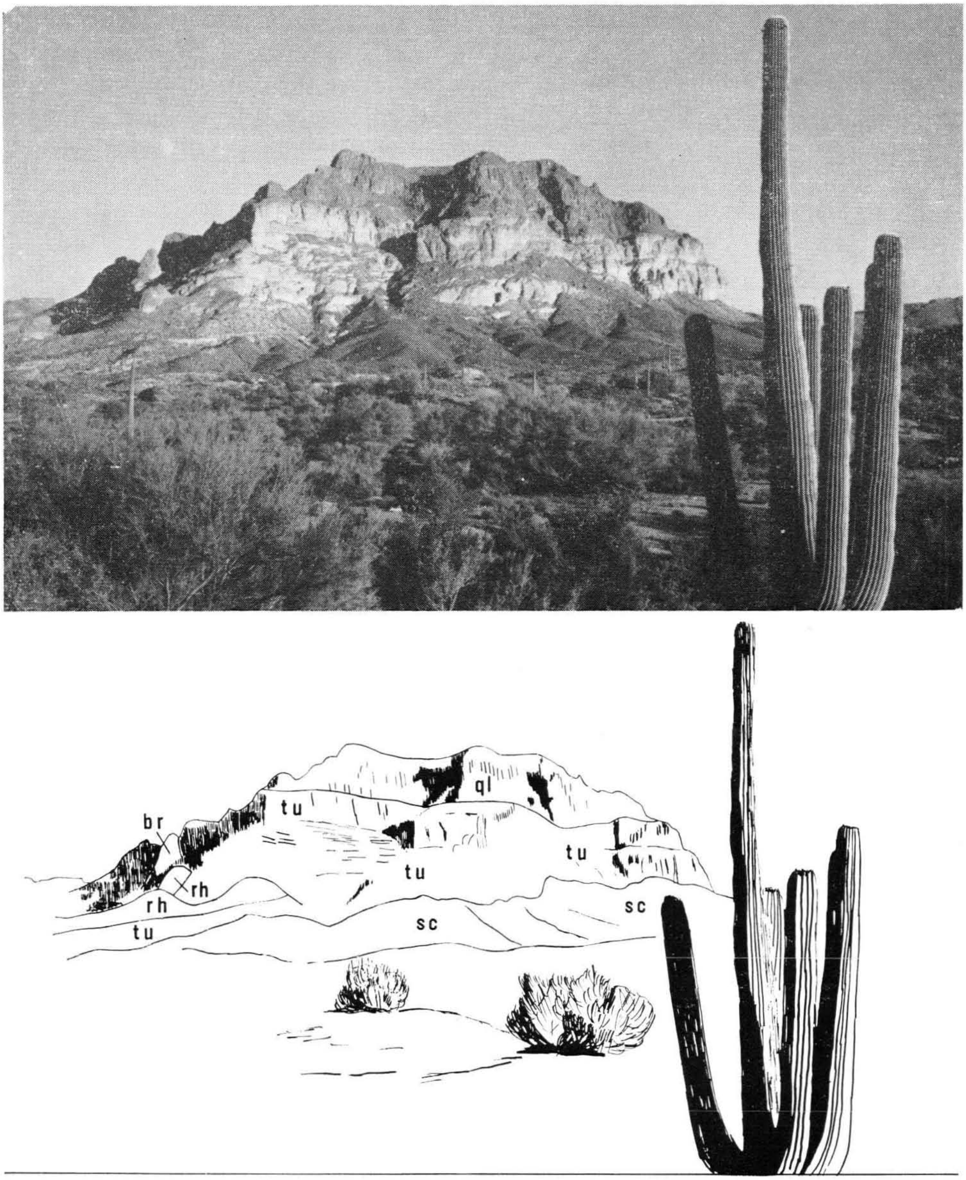

FIGURE 3. Picketpost Mountain viewed from the northwest. The dark slopes at the base of the mountain are Pinal Schist which is overlain by the light-colored beds of tuff. The darker layers whose base is about two-thirds of the way to the top are quartz latite lava flows. Rhyolite caps a low ridge on the left, and a small quartz latite plug is visible. Key to symbols: sc — schist; tu — tuff; rh — rhyolite; br — breccia; ql — quartz latite.

GEOLOGIC SETTING OF PICKETPOST MOUNTAIN

Picketpost Mountain stands at the southwest edge of the northwest- to west-trending valley of the Queen Creek drainage system. The hilly to mountainous terrain to the south and west is mostly underlain by the Pinal

Schist of early Precambrian age. Directly south of Picketpost Mountain is a mile-wide belt of vertical to steeply eastward-dipping sedimentary rocks of the Apache Group of Precambrian age. Both the schist and the sedimentary rocks have been intruded by diabase. The hills and mountains on the opposite side of the valley of Queen Creek, to the north and east, are underlain by rocks ranging in age from Precambrian to Tertiary. The Precambrian and Paleozoic sedimentary rocks generally dip eastward, and are cut by a complex network of faults (Short and others, 1943; Peterson, D. W., 1962). Much of this area is covered by a widespread dacitic ash-flow sheet of mid-Tertiary age. The valley of Queen Creek near Picketpost Mountain is filled with alluvial gravels of Tertiary and Quaternary age.

Extending around the base of the mountain from the north to the southeast side are rhyolitic lava flows interlayered with pyroclastic beds. These volcanic rocks extend a considerable distance to the southeast and cover an area of several tens of square miles. Their age is uncertain but is probably either Tertiary or Quaternary. Picketpost Mountain is composed entirely of volcanic rocks, which include rhyolitic lava, water-laid and air-fall tuff, and both vent rocks and lava flows of quartz latite composition. The rocks at Picketpost Mountain are briefly described by Wilson and Roseveare (1945, p. 5-6).

The origin of Picketpost Mountain and the relation of its rocks to the dacite exposed on Apache Leap (Fig. 1) are subjects of considerable local interest. The observer notices, from a distance, that the rocks capping Picketpost bear a marked resemblance to the dacite on Apache Leap, and he also can readily project the basal contact across the several-mile interval. It is natural to speculate that Picketpost Mountain might be an erosional outlier of the dacite sheet. Short and others (1943, p. 45) regard the rocks on Picketpost as being part of the dacite series.

Because of the questions on the relationship between the quartz latite capping Picketpost Mountain and the dacitic ash-flow sheet, considerable attention is devoted to the quartz latite unit and to speculation on its origin, but the prevolcanic rocks and the rhyolitic, tuffaceous, and basaltic rocks at the base and on the flanks of the mountain are only briefly discussed. It is concluded that the quartz latite has an entirely different origin from the dacitic ash-flow sheet. Furthermore, an examination of neighboring areas shows that the rocks on Picketpost are distinctly younger than the dacite.

The geologic map (Fig. 4) shows that the flat top of the mountain is composed of a quartz latite lava flow that overlies the bedded pyroclastic rocks. The lava flow extends from a vent that occupies much of the northwestern flank of the mountain. The cross sections (Fig. 5) are interpretations of the structure of the mountain.

DESCRIPTION OF ROCK UNITS

Prevolcanic Rocks

The oldest rock of the area, the Pinal Schist, crops out along the western edge of the geologic map, and underlies the western flanks of the mountain (Figs. 3, 4). It is a fine-grained quartz-mica schist, with moderately to well-developed foliation.

The schist is overlain, with nearly vertical contact, by the sedimentary rocks of the Apache Group. These rocks include the Pioneer Formation with the Scanlan Conglomerate Member at its base, and the Dripping Spring Quartzite with the Barnes Conglomerate Member at its base. The sedimentary strata strike north and dip steeply eastward, and some of the beds are vertical. Diabase of probable Precambrian age has intruded both the Apache Group and the Pinal Schist; the diabase and Apache Group rocks have been combined as a single map unit in Figure 4. Detailed descriptions of these formations are given by Ransome (1903, 1919), Short and others (1943), and in other reports on adjacent regions.

Basalt

Basalt crops out in several areas along Arnett Creek north of Picketpost Mountain. Outcrops are subdued, the rock is generally massive, but locally shows partings along flow planes. The weathered basalt is medium to dark gray and commonly has a bluish cast; it is locally vesicular. The base of the basalt is not exposed, and the relationships and age relative to adjacent rocks have not been established with certainty. The basalt bodies, however, are interpreted here as lava flows that were extruded before the eruption of the overlying tuff.

On the fresh surfaces the rock is dark gray to greenish black; it grades to lighter shades of gray where altered. Megascopically it is a dense rock with a uniform aphanitic texture, and it completely lacks phenocrysts. The microscopic texture is intergranular, and the rock is composed of about 55 per cent plagioclase (An_{65-70}), 30 per cent pyroxene, and 15 per cent opaque minerals. Equant grains of pyroxene and the opaque minerals are uniformly distributed through a felted mass of thin plagioclase laths. The plagioclase laths average 0.1 to 0.2 mm. long and have a maximum length of 0.5 mm.; the pyroxene and opaque grains average about 0.05 mm. in diameter, and reach a maximum diameter of about 0.1 mm.

Tuff

The steep-sided flanks of Picketpost Mountain are mainly composed of distinctly bedded, light-colored tuff (Fig. 3). Tuff also occupies part of the canyon cut by Arnett Creek north of Picketpost Mountain, and it crops out in several localities southeast of the mountain (Fig. 4). It continues beyond the area of Figure 4 and crops out over several square miles to the south and southeast, and scattered outcrops are also found to the north.

Beds range from thin to thick, and crossbedding is locally common. The weather tuff tends to stand as steep cliffs, and outcrops are generally very pale shades of grayish yellow or brown, but on fresh surfaces the color generally ranges from pale grayish yellow to very light gray to nearly white. Lithology is highly varied and the rock ranges widely in composition and texture, but perhaps the most common type can be classed as vitric crystal tuff. Differing amounts of fine-grained crystals of plagioclase, quartz, and biotite, and scarce to abundant lithic fragments and pumice lumps are set in a fine-grained vitric matrix which shows slight to complete devitrification and alteration.

The tuff unconformably overlies the Precambrian rocks at the western and southern base of the mountain, and conformably overlies the basalt in the canyon of Arnett Creek. The tuff in Arnett Creek and in Telegraph Canyon (Fig. 4) is overlain by rhyolite flows; in turn, the rhyolite is overlain by additional tuff beds on the flanks of Picketpost Mountain. In the southeastern corner of the area, tuff is both underlain and overlain by rhyolite. Sections AA′ and BB′ (Fig. 5) illustrate the interlayering of tuff with rhyolite. The tuff high on the flanks of the mountain is overlain by quartz latite.

Rhyolite

Rhyolitic lava flows cover much of the low-lying ground from the northern to the southeastern side of Picketpost Mountain (Figs. 2, 4), and similar flows are found in several localities within 5 or 10 miles of the mountain both to the north and south. The rock weathers to bold, craggy outcrops and generally forms very rough terrain. The weathered rock is light to dark gray, and locally may be stained various shades of brown.

Flow structures are generally prominent, and they change at random from even and regular, through broad, swirling arcs, to tightly contorted folds. Locally the flow structures become inconspicuous or disappear, and the rock assumes a massive appearance. Lithophysae, quartz- or opal-lined cavities, and other spheroidal structures are locally abundant.

The rock varies from aphanitic to glassy, and phenocrysts are either absent or sparse. The aphanitic rock results from devitrification and alteration, and consists of microscopic crystallites of feldspars and silica minerals. Flow planes are defined by variations in degree and kind of crystallization. Completely crystallized rock grades into rock with alternating layers of crystallized and glassy material, and to entirely glassy rock. The glassy rock is generally characterized by moderately to well-developed perlitic structures.

At several places along and beyond the eastern margin of Figure 4, the glassy perlitic rock has expansion properties that meet commercial requirements and is being mined as perlite from several pits. The commercial perlite is light gray to milky white. Strongly developed spheroidal perlitic structures, from a millimeter to several tens of centimeters in diameter, are

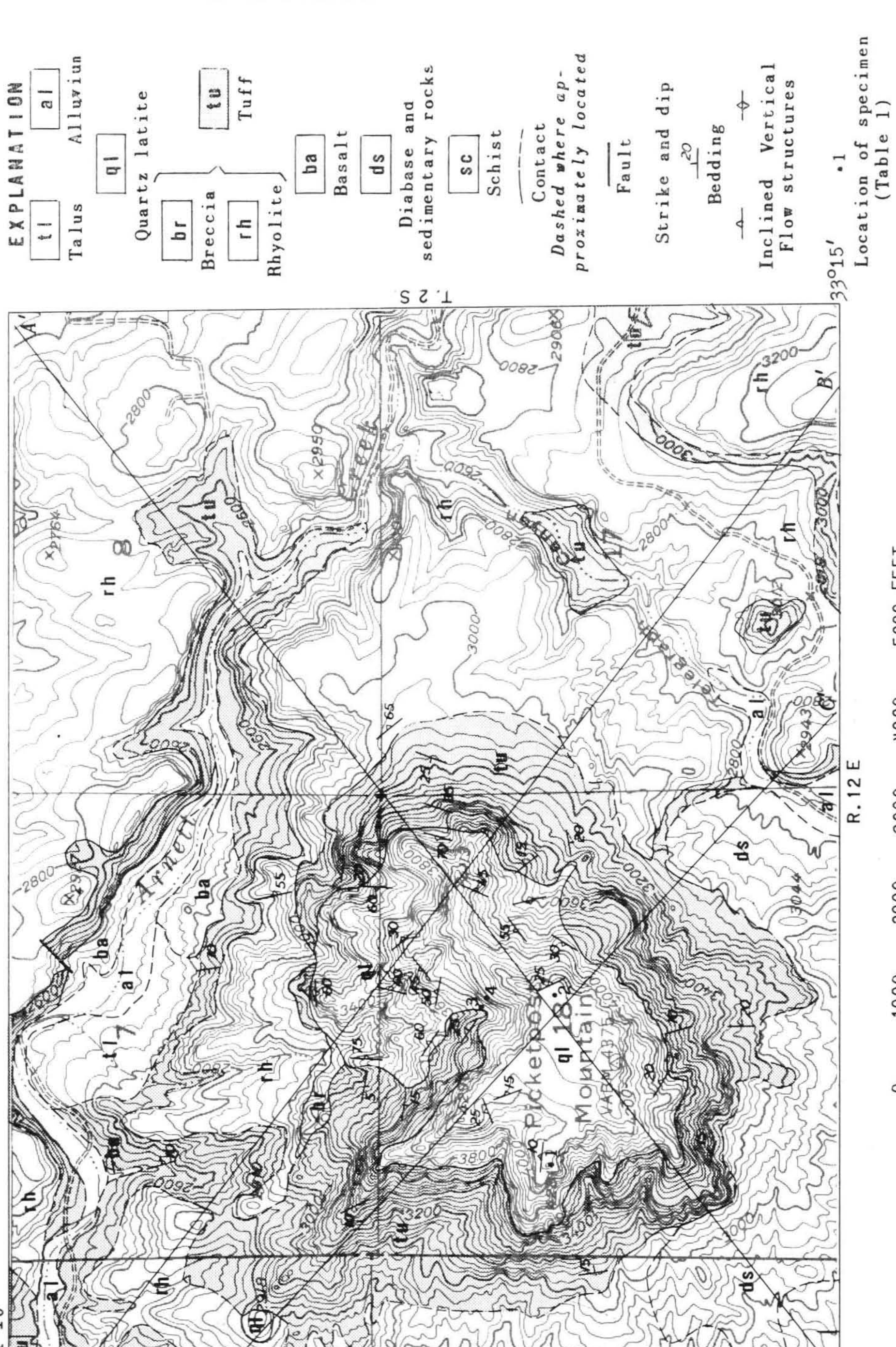

FIGURE 4. Geological map of Picketpost Mountain and adjacent area.

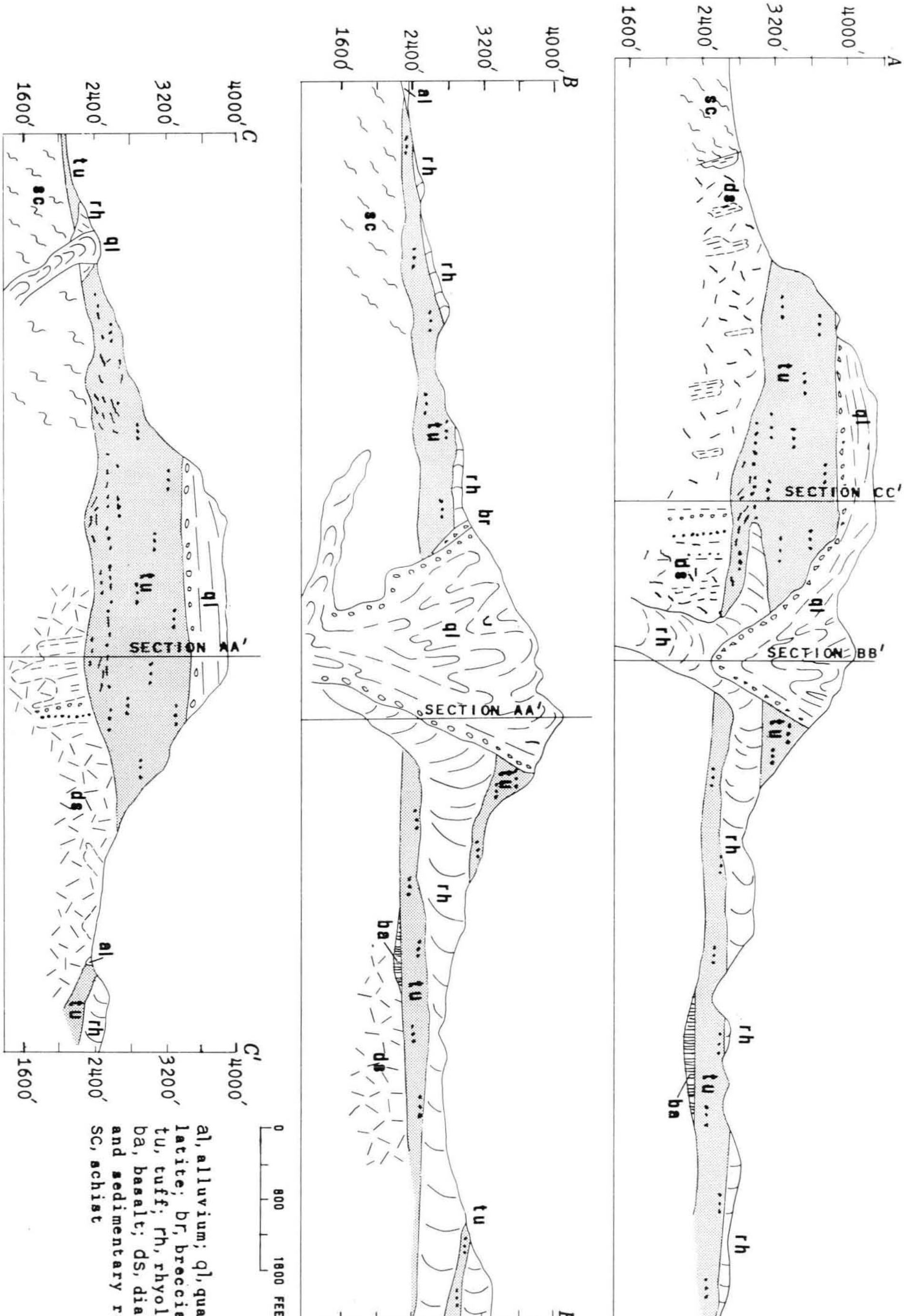
A A'
B B'
C C'
4000'
3200'
2400'
1600'
SECTION CC'
SECTION BB'
SECTION AA'
al, alluvium; ql, quartz latite; br, breccia; tu, tuff; rh, rhyolite; ba, basalt; ds, diabase and sedimentary rocks; sc, schist
0 800 1600 FEET

FIGURE 5.

successively superimposed one upon another. Randomly scattered through the rock, like plums in a pudding, are subspheroidal nodules of black obsidian, known technically as marekanites, or commonly as Apache tears. The main mass of perlite contains several per cent water, whereas the nodules have a very low water content. The perlite is described by Wilson and Roseveare (1945, p. 5), Anderson and others (1956, p. 11), and Jaster (1956, p. 380), and the nature of the bonding of water in this perlite is discussed by Keller and Pickett (1954).

The rhyolite rests everywhere on tuff within the area of Figure 4. The interpretations of Figure 5 indicate that flows are interbedded with later tuff beds, as illustrated by sections AA′ and BB′. The interpretation presented here shows a hypothetical source vent of rhyolite partly cut by a younger vent of quartz latite.

Breccia

A body of volcanic breccia that stands in bold outcrops forms a tall pinnacle about a third of the way up the north flank of Picketpost Mountain. It is shown on the map of Figure 4, and is visible in both Figures 2 and 3. Several other irregular bodies of breccia crop out on the flanks of the mountain, but because of either their small size or vague boundaries, they have not been separately mapped.

The breccia is composed of angular blocks and fragments of tuff and other lithic material such as diabase, rhyolite, and schist in a heterogeneous pyroclastic matrix. The breccia forms a steep dike (Fig. 6) that has intruded along the contact between tuff and rhyolite and cuts across tuff beds at nearly right angles.

Quartz Latite

Quartz latite lava flows which form the flat-topped cap of Picketpost Mountain emerge from a steep-walled conical vent that occupies the northeastern flank (Figs. 4, 5). Quartz latite also forms a small plug near the northwestern base. The quartz latite crops out as cliffs and steep slopes and weathers to shades of reddish brown and grayish brown.

The lava flows at the summit of the mountain (Fig. 7) are characterized by broadly undulating, closely spaced flow planes. The planes tend to lie close to horizontal, but the rather random undulations result in gentle variable dips in every direction. The continuity and general regularity of the planes impart a layered appearance to the rock. The flow planes commonly weather to series of partings, whereas on fresh surfaces the planes are expressed by color and density changes. Thin, irregular, vuggy zones are common along the flow partings. Some of the layers exposed in the steep cliffs near the summit are cut by well-developed columnar joints. The columns stand nearly vertical as they are approximately at right angles to the flow planes, and most columns are between 1½ and 3 feet in diameter.

FIGURE 6. Thin-bedded tuff, on left, intruded by dike of breccia. This contact is just east of the prominent breccia pinnacle on the north flank of Picketpost Mountain.

The rock in the vent on the northeastern flank of the mountain is characterized by flow planes similar to those on the summit except that, instead of being flat or gently dipping, they are broadly swirling and wildly contorted, and their dips range from horizontal to vertical. The walls of the vent dip steeply inward, and the vent has the shape of an inverted cone (Fig. 5, sections AA′ and BB′).

A small plug of quartz latite crops out low on the northwestern flank of the mountain (Figs. 3, 4, and 5, sec. CC′). It is nearly circular in outline, and is about 200 feet in diameter. It intrudes both tuff and rhyolite, has steeply dipping to vertical walls, and shows well-developed flow layering parallel to the walls.

The quartz latite is porphyritic, and its groundmass exhibits a wide variety of textures, ranging from glassy to aphanitic, and from flow-layered to brecciated. Regardless of the texture of the groundmass, however, the phenocrysts are nearly uniformly distributed throughout both the vent rock and the extrusive flow, and they comprise from 20 to 30 per cent of the rock. Most phenocrysts are euhedral or subhedral, but many quartz crystals and a few feldspar crystals have deeply embayed boundaries. Phenocrysts range from a fraction of a millimeter to about 4 mm. in diameter, and average

FIGURE 7. Nearly horizontal flow structures in the quartz latite show broad, gentle undulations, and are locally cut by well-developed columnar joints.

from ½ to 1 mm. Modal analyses by point counting methods have been made of a few thin sections, and relative proportions of phenocrysts are shown in Table 1. Throughout most of the rock the groundmass is free of broken fragments of phenocrysts.

TABLE 1. MODES OF QUARTZ LATITE SPECIMENS
(Location of specimens shown on geologic map)

Specimen No.	*1*	*2*	*3*	*4*
Phenocrysts	25	27	30	27
Groundmass	75	73	70	73
Relative Proportions of Phenocryst Minerals				
Plagioclase (An_{35-40})	55	51	66	61
Sanidine	6	11	2	1
Quartz	23	25	12	16
Biotite	13	9	11	14
Hornblende	3	3	7	7
Opaque minerals	tr	1	2	1
Accessories (sphene, apatite)	tr	tr	tr	tr

Although plagioclase is the most abundant phenocryst mineral, the rock is classed as a quartz latite because, with only 2 to 30 per cent phenocrysts, appreciable quartz and some sanidine occur as phenocrysts. This suggests that the magma was saturated with these constituents at the time of solidification; hence the matrix is likely to be richest in potential silica and potassic minerals.

Quartz latite with a block glassy groundmass, a vitrophyre, is confined to a single zone which is near the base of the lava flow and which continues around the border of the vent. The vitrophyre zone ranges from 3 to 20 feet thick. Much of the vitrophyre, both at the base of the flow and along the walls of the vent, is a breccia composed of blocks and fragments of vitrophyre in a matrix of very similar material. The vitrophyre is locally randomly intermixed with irregular stringers of pyroclastic rock, some extending upward or inward from the adjacent tuff, and some disconnected from it. The glassy zone is generally separated from the bedded tuff by a few feet of somewhat porous aphanitic breccia. The vitrophyre is interpreted as an autobreccia forming the chilled base of the flow and border of the vent. During emplacement, the chilled crust of lava was locally broken up by continuing movement, and blacks were incorporated in the still-fluid portions of the lava. Autobreccias are common at the base of silicic lava flows and at borders of vents. A zone of vitrophyre also encircles the small plug on the northwest side of the mountain.

The aphanitic quartz latite, away from the chilled border zone, is typically characterized by more or less regular, continuous flow structures (Fig. 7). On the fresh surface these are expressed by alternations in color which largely reflect variations in the degree of crystallinity of the groundmass. On the fresh surface the groundmass alternates among various shades of gray. Microscopic examination shows that the darker gray rock is relatively less crystallized and is composed mostly of glass, whereas the lighter gray rock shows a greater degree of crystallization. Some rocks are completely crystalline and the groundmass is a microcrystalline mass of low birefringence. In some the crystallization has progressed far enough to enable feldspars and silica minerals to be recognized. Some of the partly crystalline rocks contain tiny but well-defined spherulites with radial structure.

In some places, within both the vent and the extrusive flow, the rather uniform texture is interrupted by an abrupt transition to distinctly pyroclastic texture. The pyroclastic material ranges from tiny microscopic stringers to definite layers a few inches thick interbedded with the flow rocks. The pyroclastic texture is unmistakable, and even the groundmass of this material is full of minute fragments of broken phenocrysts and dust, imparting a clastic rather than a fluidal texture to the rock.

The quartz latite lava flow rests nearly conformably on the underlying tuff. The quartz latite vent intrudes this tuff, cutting across beds with a sharply discordant contact. The adjacent tuff is generally little disturbed, but blocks, fragments, and particles of tuff have been torn loose and incorporated in the brecciated quartz latite near the contact.

ORIGIN OF THE QUARTZ LATITE

In recent years, throughout the western United States, many bodies of silicic volcanic rock that in earlier times would have been designated as lava flows have been identified as ash flows (ignimbrite). Evidence pertinent to proper identification may sometimes be difficult to recognize, and criteria are often gradational, so a careful study should be made before designating the origin of a silicic volcanic rock. Among the best discussions of criteria for recognizing ash flows are papers by Ross and Smith (1961) and Smith (1960a).

An extensive sheet of silicic volcanic rock covers much of the area near Picketpost Mountain. Ransome (1903, p. 88-95) identified the rock as a dacite, and believed it to be a lava flow which rested on a basal tuff. Later studies have shown that the rock is an ash-flow sheet and that much of it is composed of welded tuff (Peterson, N. P., 1962; Peterson, D. W., 1961). Evidence supporting this conclusion includes the wide lateral extent of the sheet, zoning typical to ash-flow sheets based on both degree of welding and type of groundmass crystallization, relict deformed pyroclastic textures, and gradation into basal nonwelded tuff.

Ransome's name of dacite was based on the predominance of plagioclase and the presence of quartz phenocrysts in the rock. Chemically the rock is a quartz latite (Peterson, 1961, p. 8, 111), but because of firmly established usage both locally and in geologic literature, and because dacite correctly describes phenocryst mineralogy by megascopic and microscopic classification schemes, the name dacite has been retained for the rock. This illustrates the inconsistencies inherent in naming many volcanic rocks. Insofar as possible, a chemical scheme should be used because it reflects the composition of the entire rock rather than the fractional portion represented by phenocrysts. Volcanic rock classification schemes, however, generally have sufficient flexibility to permit deviations due to special circumstances.

Picketpost Mountain is 4 to 5 miles west of Apache Leap, which is capped by hundreds of feet of the dacite. The quartz latite on Picketpost Mountain lies at the same general elevation as the dacite on Apache Leap. The question of whether they belong to the same rock unit must be considered.

From a distance the outcrops are similar, both in color and in weathering characteristics. In hand specimen the rocks are similar, but not identical. Both are readily recognized as silicic volcanic rocks, and they may be very close in color. Both are porphyritic, with a predominance of plagioclase phenocrysts and lesser amounts of quartz, sanidine, biotite, hornblende, and opaque minerals. Microscopic studies show that the percentage of phenocrysts in the dacite is appreciably higher, ranging from 35 to 45 per cent, where the quartz latite contains 20 to 30 per cent phenocrysts, but this criterion is not necessarily diagnostic. Much of the dacite contains a relatively higher proportion of plagioclase phenocrysts and a lower proportion of quartz phenocrysts than does the quartz latite, but phenocryst proportions of part of the dacite do overlap with those of the quartz latite. Phenocrysts in the quartz latite tend to be unbroken, whereas those in the dacite commonly show broken faces.

The following criteria have been used to reach the conclusion that the quartz latite is indeed a lava flow instead of an ash flow:

(1) Flow structures in the quartz latite are continuous and regular (Fig. 7). Flowlike structures in ash flows, including the dacite, are lenticular and discontinuous.

(2) Pyroclastic and vitroclastic textures, pumice fragments, shards, and eutaxitic structure are missing from the bulk of the quartz latite, and no relict textures can be distinguished. These textures are an important criterion in identifying the dacite as an ash-flow sheet. The pyroclastic bodies mentioned in the description of quartz latite lie in discrete layers and comprise but a small fraction of the rock; the adjacent nonpyroclastic layers contain no trace or sign of pyroclastic texture.

(3) Zoning typical of ash flows is lacking. One of the principal criteria for recognition of ash flows is a zoning based on systematic downward increase in degree of welding of shards and pumice fragments (Smith, 1960b); this is well displayed in the dacite, but because there are no appropriate particles or fragments in the quartz latite, such zoning is completely lacking. Zoning by type of crystallization of the groundmass is also a characteristic of ash flows (Smith, 1960b) and is well developed in the dacite, but no evidence for this type of zoning has been observed in the quartz latite. Instead, strong differences are observed in the degree of crystallization of the groundmass between adjacent flow layers.

(4) Broken fragments of phenocrysts are absent or rare in the groundmass of most of the quartz latite. In rocks where broken crystal fragments are abundant, a violent eruption, such as an ash flow or pyroclastic explosion is suggested. The dacite groundmass contains abundant broken crystal fragments. Their rarity in the quartz latite is consistent with a quieter, fluidal type of eruption, such as a lava flow.

(5) The autobreccia at the base of the flow and around the walls of the vent is typical of many lava flows. Although the basal rocks of ash flows may contain abundant xenoliths, they do not characteristically contain autobrecciated zones.

The above criteria are probably sufficient to establish that the quartz latite represents a lava flow issuing from a vent, but a few seemingly contrary facts must be explained.

The pyroclastic layers within the quartz latite perhaps can be most readily explained either as: (1) pieces of semiconsolidated wallrock or underlying tuff torn off by the advancing lava and intimately intermixed during subsequent movement, or (2) as products of pyroclastic eruptions landing on and intermixing with still-fluid lava. Both of these mechanisms may have operated.

The flow layering on the flat-topped summit of the mountain is uniform instead of contorted, and it varies from horizontal to gently dipping without abrupt changes (Fig. 7). A lava flow as silicic as this rock would be expected to be viscous and to exhibit highly contorted flow structures. Another feature rarely observed in silicic lavas is polygonal columnar jointing (Fig. 7). Such joints are common in basalt and andesite lava flows and in silicic ash flows, so if this rock is a lava flow, their presence is paradoxical. The columnar joints and the regular, uniform flow layering may well be related to the same basic cause. Two alternate possibilities are proposed here to explain how both features might develop in a silicic lava.

One possibility is that the flow issued from the vent as an unusually thick mass that moved uniformly across a surface of low relief. The uniform movement and the lack of topographic irregularities resulted in gently undulating rather than highly contorted flow structures. A further result would be that during the cooling history isotherms were smooth and regular, and that major flow movement ceased before the principal hardening of the groundmass. These are conditions conducive to the formation of vertical columnar joints.

Another possibility is that the lava had an abnormally low viscosity for a silicic rock. It may be that an unusually high content of volatiles lowered the viscosity to a degree permitting both uniform flow and a regular pattern of isotherms during the cooling.

The criteria favoring a lava-flow origin for the quartz latite seem distinctly stronger and more definite. The apparently contrary criteria are not as compelling, and they do have rational, though somewhat speculative, explanations. The evidence, therefore, distinctly favors the viewpoint that the quartz latite is a lava flow. The even flow layering, columnar joints, and pyroclastic layers suggest an unusual type of lava flow, however, and the rock should be an interesting subject for future studies.

The age of the quartz latite relative to the dacite cannot be learned from evidence in the immediate area of Picketpost Mountain, for dacite does not crop out close by. However, the geologic relationships exposed in Walnut Canyon, about 8 miles south-southeast of Picketpost Mountain (Fig. 1), suggest that the quartz latite on Picketpost Mountain erupted during an episode of volcanic activity later than the dacite. These relationships, described below, were shown to me by D. C. Lamb.

Dacite crops out over a broad area in Walnut Canyon and vicinity. In several localities it is overlain by tuff beds which crop out almost continuously from Walnut Canyon to Picketpost Mountain and in scattered areas to the north. It is likely that the tuff on the flanks of Picketpost Mountain correlates with the tuff in Walnut Canyon and, if so, it is younger than the dacite. As the quartz latite both intrudes and overlies the tuff, it is younger than both the tuff and the dacite.

GEOLOGIC HISTORY OF PICKETPOST MOUNTAIN

During mid-Tertiary time, the Picketpost Mountain area was a land of moderate relief. Former geological events had tilted and faulted rocks from Precambrian to late Paleozoic in age, and all were exposed in various places at the surface. Stream-carried gravels were accumulating in local basins. During the Miocene Epoch, nearby volcanic activity was climaxed by eruptions of huge ash flows which covered the region with a dacite sheet from several hundred to some 2,000 feet in thickness. Practically a complete section of this sheet is presently exposed in Queen Creek Canyon a few miles to the east, yet no dacite crops out near Picketpost Mountain. The Picketpost area almost undoubtedly was covered by the dacite, though it may have been considerably thinner than in Queen Creek Canyon, and erosion removed this dacite before the subsequent volcanic activity. This suggests considerable uplift in the Picketpost area relative to the area a few miles east.

A resumption of volcanic activity included basalt flows followed by the eruption of a moderate amount of tuff, some of which was deposited as air-fall beds and some of which was reworked by streams. The tuff was deposited over an area of several tens of square miles, including the site of the present Picketpost Mountain and neighboring areas both to the north and south. At the site of the mountain the tuff was deposited upon steeply dipping Precambrian rocks, whereas a few miles south it was deposited on dacite. This affirms that the period between the dacite emplacement and the tuff eruptions was one of considerable local uplift and erosion. Contemporaneous with the tuff deposition, rhyolite flows were erupted and covered several square miles. Some may have issued from vents at the site of the present mountain, and these vents may also have supplied some of the tuff and breccia. Tuff eruptions continued after the rhyolite flows ceased.

Ultimately one or more lava flows of quartz latite issued from a vent which cut through the recently deposited tuff and reached a diameter of about 3,000 feet. The flows advanced an unknown distance over the neighboring area. The vent probably stood as a moderately sloping topographic high point during the volcanic activity. After volcanism ceased, erosion began cutting at the margins of the quartz latite flow and has continued to the present time. A small remnant of the flow capping and protecting the softer tuff beds underneath forms the summit of the prominent mountain of today. Erosion has exposed the upper part of the quartz latite vent on the northeast flank of the mountain, and has cut through and removed much of the tuff and part of the rhyolite flows. The sections of Figures 5 illustrate the degree of dissection.

Between Picketpost Mountain and the Gila River (Fig. 1) other volcanic rock bodies intrude, are interbedded with, and overlie the tuff, indicating fairly widespread volcanic activity during the general period in which Picketpost Mountain formed (Lamb, D. C., oral communication, 1960).

Meanwhile, further regional tectonic activity reversed the previous relative movements, and the eastward block and its dacite sheet were raised to their present relatively high elevation.

Much remains to be learned about the geology of Picketpost Mountain and the nearby areas. A detailed study of the tuff may reveal distinctions between different beds, different modes of eruption and deposition, and establish a stratigraphy. Further studies should reveal more definitely the relationships among the tuff, rhyolite, and breccia units. Detailed studies of the rhyolite flows may reveal information concerning the origin of perlite. The quartz latite possibly represents an unusual type of lava flow which further studies will help to understand. Additional problems include the nature of the complex deformation that occurred between the time that the dacite was emplaced and the time of the tuff and rhyolite eruptions, the structural framework that determined the location of the vent at Picketpost Mountain, and the type and extent of the deformation, erosion, and sedimentation following the eruption of the quartz latite lava flow.

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