MAP GQ-669

DEPARTMENT OF THE INTERIOR
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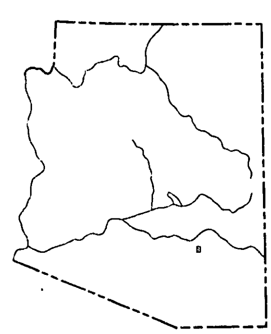
GEOLOGIC QUADRANGLE MAPS OF THE UNITED STATES

GEOLOGIC MAP OF THE HOLY JOE PEAK QUADRANGLE PINAL COUNTY, ARIZONA

By
Medora H. Krieger



QUADRANGLE LOCATION

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DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

Alluvium (0- about 15 ft).—Flood-plain deposits along Aravaipa Creek composed of sandy silt, mudstone, and some sand and gravel, locally cemented with caliche; along washes largely unconsolidated sand.

Landslides (0-100? ft).—Consist largely of Galiuro Volcanics locally cemented with caliche.

Talus (0- about 50 ft).—Rock debris consisting of large angular blocks to silt-sized particles, locally cemented with caliche.

Gravel veneer on pediments and lower terraces (0-25 ft).—Largely subangular pebbles and cobbles of Paleozoic and Precambrian rocks in a generally reddish-brown, fine- to coarse-grained matrix. Reddish-brown color less pronounced on younger terraces and generally lacking on higher level (above 4,000 ft), older(?) surfaces where gravels are composed largely of Galiuro Volcanics. Locally includes some pediments and terraces stripped of gravels.

Surficial deposits, undivided (0-20 ft).—Include fine-grained colluvium and alluvium, talus, and some pediment and terrace gravels.

GILA CONGLOMERATE (0-3,000? FT)

A conglomeratic and a fine-grained, lacustrine facies with intertonguing contact; the change generally occurs within ¼ mile and probably reflects a buried fault. The Gila in this area is assigned to the Pliocene because of the presence of pre-Blancan vertebrate fossils in presumably equivalent beds (J. F. Lance, oral communication, 1963) southeast of Mammoth.

Fine-grained facies (maximum of 400 ft exposed).—Thin- and evenly-bedded, grayish-orange-pink to yellowish-gray clay, silt, marl, and very fine grained sand; thin beds of gypsum, a few of white rhyolite tuff, diatomite, and opaline-appearing material. Arborescent manganese concretions (6 in. or more high) of probable hydrothermal origin occur in the fine-grained facies in a gulch (NE¼ sec. 29, T. 7 S., R. 17 E.) north of Zapata Wash. Forms vertical cliffs along many washes; elsewhere largely concealed by unmapped alluvium, colluvium, and pediment and terrace gravels.

Coarse-grained facies (0- about 600 ft exposed).—Fanglomerate consisting of subangular to subrounded pebbles, cobbles, and small boulders of Precambrian and Paleozoic rocks, lesser amounts of Galiuro Volcanics, and in the southern part Upper Cretaceous and (or) lower Tertiary rocks. Matrix is light shades of gray, green, and brown and generally well cemented, and is composed of small-pebble to silt-sized particles.

Rhyolite tuff (0-50 ft).—White rhyolite tuff bed.

GALIURO VOLCANICS

Includes andesite of Table Mountain, Apsey Conglomerate Member, Hells Half Acre Tuff Member, andesite and conglomerate of Virgus Canyon, Aravaipa Member, tuff and conglomerate of Bear Springs Canyon, andesite and conglomerate of Depression Canyon, tuff of Oak Springs Canyon, Holy Joe Member, and andesite of Little Table Mountain. K-Ar determinations on biotite and sanidine from the Hells Half Acre Tuff, Aravaipi, and Holy Joe Members, and from the tuff of Bear Springs Canyon yielded ages of 22.4 to 25.9 million years (S. C. Creasey, oral communication, 1965) indicating a Miocene age.

ANDESITE OF TABLE MOUNTAIN[1] (ABOUT 400 FT)

Medium-light- to dark-gray, vesicular to nonvesicular, nearly horizontal flows and flow breccias, some of which have prominent platy jointing and flow structure. Phenocrysts are of olivine (mostly less than 0.5 mm) that are mostly altered to iddingsite, lesser amounts of small pyroxene, and abundant magnetite (mostly less than 0.1 mm) in a groundmass of plagioclase, magnetite, pyroxene, and rutile. Some flows have plagioclase and a few pyroxene phenocrysts (both mostly less than 0.3 mm) and a few large, completely altered olivines(?) in a trachytic groundmass of plagioclase laths (mostly less than 0.1 mm), magnetite, and glass. Staining with cobaltinitrite reveals some potassium feldspar(?) in the groundmass of both types.

APSEY CONGLOMERATE MEMBER[2] (40-NEARLY 300 FT)

Cliff-forming, thin-bedded, yellowish- to light-gray conglomerate and some conglomeratic and agglomeratic tuff; composed of pebbles, cobbles, and scattered boulders largely derived from the rhyolite-obsidian member (Krieger, 1967a). It also contains sparse to abundant fragments from older rocks, including older members of the Galiuro Volcanics. The well-indurated, sandy, mostly noncalcareous matrix consists of quartz, feldspar, and many small rock and crystal fragments. Pumice shards and lapilli are common in some of the conglomerate. The lower part for some distance north of Table Mountain is a steep slope-forming sandstone to cobble conglomerate that contains little or no rhyolite or pumice.

HELLS HALF ACRE TUFF MEMBER[2] (0-ABOUT 50 FT)

White, air-fall and partly reworked vitric, crystal, and lithic tuff with rhyolite and pumice lapilli and a few accidental fragments. Lower units are not present in this quadrangle.

ANDESITE AND CONGLOMERATE OF VIRGUS CANYON

Conglomerate (0-50 ft).—Pebbles and cobbles derived from lower andesite of Virgus Canyon and older rocks in a sandy matrix.

Lower andesite (intermediate andesite unit of Simons, 1964) (0-100 ft).—Medium-gray, light-brown-weathering, mostly very coarsely porphyritic andesite (the so-called turkey-track porphyry of Cooper, 1961) with platelike plagioclase as much as 2 cm long and 0.2 cm thick; small (mostly less than 1 mm) olivine(?) altered to orange iddingsite (bowlingite?), and minor clinopyroxene in a groundmass of plagioclase laths, clinopyroxene, iron ore, altered olivine, and apatite needles. Staining with cobaltinitrite reveals some potassium feldspar in the groundmass.

ARAVAIPA MEMBER (WHITE TUFF AND UPPER WELDED TUFF UNITS OF SIMONS, 1964) (150-200 FT, LOCALLY 300 FT; THIN OR ABSENT WHERE IT LAPS OUT AGAINST HILLS OF OLDER ROCKS)

Rhyolitic ash-flow tuff, a simple cooling unit and possibly a single flow unit[3], with a well-developed zonal pattern. Contacts between most zones are abrupt. Composed of pumice shards and lapilli, crystal fragments (not abundant) of quartz, sanidine, plagioclase, and biotite, and minor accidental fragments.

Upper nonwelded zone (0-100 ft).—Massive, slope-forming white tuff characterized by devitrification and vapor-phase crystallization. Local honeycomb or Swisscheese effect in lower part due to irregular case hardening of surface, later pitted by wind erosion. Contact with underlying zone sharp,

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[1] Andesite of Table Mountain occupies the same stratigraphic position as the upper andesite unit of Simons (1964), north of Aravaipa Canyon, Klondyke quadrangle; and basalt of the Gila Conglomerate (Willden, 1964) in southern part of the Christmas quadrangle.

[2] Upper tuff unit of Simons (1964) includes Apsey Conglomerate and Hells Half Acre Tuff members.

[3] Terminology for pyroclastic rocks from Ross and Smith (1961) and Smith (1960).

except where more intense vapor-phase crystallization has crossed the contact.

Partly welded, welded, and lower nonwelded zones (150-200 ft).—Largely cliff-forming and consisting of from top to bottom: (1) Columnar-jointed, vapor-phase zone (10-50 ft, mostly less than 25 ft). Very light shades of gray and brownish-gray, slightly welded, devitrified tuff with vapor-phase crystallization pronounced in pumice lapilli. (2) Welded, devitrified zone (about 100 ft). Light shades of brown and red, dark-weathering tuff that becomes darker colored and densely welded downward. Some vapor-phase crystallization in pumice lapilli in upper part. Thoroughly devitrified, becoming less so near base. Basal 50 ft or so is characterized by large vugs and silica-lined or filled lithophysae (the "vuggy" zone). Locally "thunder eggs" at the base are as much as 10x15 cm. (3) Thoroughly welded zone (20-30 ft). Black and dark-brownish-gray vitrophyre with local brown oxidized lenses and devitrified spots. (4) Lower nonwelded zone (10 ft). Grayish-orange-pink vitric tuff, becoming lighter colored to nearly white at base.

TUFF AND CONGLOMERATE OF BEAR SPRINGS CANYON[4]

Conglomerate (0-50 ft).—Includes conglomerate above and below the tuff (Ttb). Composed of fragments from Paleozoic and younger Precambrian rocks and older members of the Galiuro Volcanics.

Tuff (0-120 ft).—Rhyolitic ash-flow tuff composed of pumice lapilli, crystal and some accidental fragments. Upper part, where remnant, is columnar-jointed, very light olive- and brownish-gray, partly welded tuff showing vapor-phase crystallization. Lower part is moderate-orange-pink poorly welded tuff, grading down into nearly white, nonwelded vitric tuff, with some clay alteration.

ANDESITE AND CONGLOMERATE OF DEPRESSION CANYON[4]

Conglomerate (0-50 ft).—Includes conglomerate above and below the andesite of Depression Canyon; locally may include conglomerate older or younger than this member. Composed of fragments of older rocks, including older members of the Galiuro Volcanics and andesite of Depression Canyon where above the andesite.

Andesite (0-25 ft).—Thin flows and flow remnants of gray, brown, and olive andesite, containing small phenocrysts of plagioclase, olivine (altered or partly altered to iddingsite), pyroxene, and(or) magnetite in a groundmass of plagioclase microlites, pyroxene, iddingsite, magnetite, and some K-feldspar. Small masses in northwest corner and andesite above the Holy Joe Member near Zapata Wash are tentatively assigned to this member.

TUFF OF OAK SPRINGS CANYON[4] (0-100 FT)

White to grayish-orange-pink, partly welded(?) rhyolitic tuff with crystal fragments (quartz, feldspar, and biotite), pumice lapilli, and accidental fragments. Separated in most places from Holy Joe Member and from tuff of Bear Springs Canyon (where andesite of Depression Canyon is missing) by a few feet of unmapped conglomerate.

HOLY JOE MEMBER (LOWER WELDED TUFF UNIT OF SIMONS, 1964) (0-300 FT)

Here named Holy Joe Member. Type locality on Holy Joe Peak, sec. 7, T. 7 S., R. 18 E.; more complete reference sections on north side of Table Mountain, sec. 8, T. 7 S., R. 18 E., and in Oak Springs Canyon, secs. 5 and 6, T. 7 S., R. 18 E. Quartz-latite ash-flow tuff, a single cooling unit of several ash flows; composed of abundant crystal fragments (quartz, plagioclase, biotite, and some sanidine), pumice shards and lapilli, and accidental fragments. The section in Oak Springs Canyon consists of, from top to bottom: (1) 5 ft of red (5R5/2), firmly welded, slightly devitrified tuff underlain by 20 ft of dark-gray to black, thoroughly welded vitrophyre (present at top of section almost everywhere) that grades down into about 25 ft of light-brownish-gray to pale-red welded tuff, exhibiting slight vapor-phase crystallization; (2) 60-70 ft of pale-red to light-brownish-gray welded tuff, showing considerable devitrification and vapor-phase crystallization; (3) 50 ft of brownish-gray to pale-brown, devitrified welded tuff, less devitrified downward; (4) 30 ft of medium-dark-gray, thoroughly welded vitrophyre, underlain by 8 ft of pale-brown vitrophyre; (5) 4 ft of grayish-orange-pink to white (at base), nonwelded, vitric tuff. Individual flows in places are separated by pumice lapilli rafted on top of flows, and by fumeroles that end beneath the next overlying flow. Thin outcrops, largely of vitrophyre, north of Oak Springs Canyon may represent the upper vitrophyre, rather than the lower one. Effect of buried hills on ash flows is well illustrated in NW¼ sec. 6 and SE¼ sec. 5, T. 7 S., R. 18 E., where the vitrophyre crosses flow lines. Around Table Mountain and Holy Joe Peak the member forms dark cliffs with prominent horizontal planes that represent individual flows and(or) zones of intense welding.

ANDESITE OF LITTLE TABLE MOUNTAIN

Porphyritic andesite[5] (0-60 ft, except near Zapata Wash, where thicker section includes some nonporphyritic andesite).—Dark-gray and brownish-gray, somewhat vesicular, very coarsely porphyritic andesite (the so-called turkey-track porphyry of Cooper, 1961). Phenocrysts are of platelike plagioclase (as much as 15 x 2 mm), less abundant altered olivine(?), and minor magnetite; some flows have sparse pyroxene phenocrysts. The groundmass consists of plagioclase laths, magnetite, pyroxene, iddingsite, and some potassium feldspar(?).

Andesite[5] (0-600 ft, increasing to over 1,000 ft southeast of quadrangle, Simons, 1964, p. 70).—Gray and red, vesicular, nonvesicular, and platy andesite, forming flows, flow breccia, and agglomerate; very minor amounts of interbedded tuff. Some cliff-forming flow breccia on southwest slope of Little Table Mountain is 50 ft thick and contains many 1-ft blocks and scattered 6- to 8-ft blocks of andesite in a fragmental matrix. Phenocrysts (mostly less than 1 mm) are of plagioclase (largest), pyroxene, and magnetite; olivine or altered olivine(?) is locally present; some are 2-3 mm in diameter. Some flows have completely altered, reddish-brown phenocrysts (2-3 mm). The groundmass is dense and fine-grained, and composed of plagioclase microlites, pyroxene, opaque oxides, and some interstitial K-feldspar. Chalcedonic, platelike and flowerlike nodules, as much as 2 in. in diameter, are common, especially near the saddle between Table and Little Table Mountains.

Andesite dike.—Four small dikes of mafic rock cut the Glory Hole Volcanics and Copper Creek Granodiorite. Possibly related to andesite of Little Table Mountain. The one in the eastern part of sec. 29 contains large phenocrysts of hornblende.

Latitic lavas of Zapata Wash (500 ft?).—Very fine grained, aphanitic to almost glassy flows, flow breccias, and vent material in shades of gray, brown, and olive. Swirly and straight flow banding is defined by variations in abundance of tiny flattened vesicles and by differences in devitrification. Many vesicles are lined or partly filled with cristobalite(?) spherules and zeolites(?). The phenocrysts are of fresh, zoned plagioclase (3 mm, mostly smaller), a little pyroxene and(or) fresh olivine (mostly less than 1 mm), and magnetite in a groundmass of plagioclase microlites, pyroxene and(or) olivine, magnetite, and glass or devitrified glass. Staining with cobaltinitrite indicates fairly abundant potassium-bearing material. Unit includes some flows of olivine andesite. The vent material is very contorted and brecciated, gray and brown, dense to almost glassy and contains angular fragments of reddish-brown vesicular latite, light- to dark-gray lithic fragments, some flow-banded rhyolite fragments, and crystal fragments (mostly plagioclase).

WHITETAIL(?) CONGLOMERATE (0-100 FT)

Composed of pebbles and cobbles of Paleozoic and Precambrian rocks and, south of Table Mountain, some Glory Hole Volcanics.

SEDIMENTARY BRECCIA

Seven small masses, probably landslide blocks; three of them rest on Glory Hole Volcanics and four of them on Copper Creek Granodiorite. Six are of Troy(?) Quartzite, one (sec. 4, T. 8 S., R. 18 E.) is of Escabrosa(?) Limestone. The largest mass (southeast corner of the quadrangle) appears to be in sedimentary contact with the overlying Glory Hole Volcanics; both may be part of a landslide block. Underlying contacts here and elsewhere are talus covered.

COPPER CREEK GRANODIORITE

Medium-gray, fine- to medium-grained granodiorite composed of plagioclase laths (mostly less than 3 mm), smaller and less abundant pyroxene, biotite, magnetite, and interstitial potassium feldspar and quartz. Intrudes the Glory Hole Volcanics as a large stock, and along the margins as sills,

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[4] Lower tuff unit of Simons (1964) includes tuffs of Bear Springs and Oak Springs Canyons and andesite of Depression Canyon.

[5] Lower andesite unit of Simons (1964) includes porphyritic andesite and andesite of Little Table Mountain.

irregular knobs, lenses, and dikes. Near some contacts it contains numerous rectangular blocks of the Glory Hole. The granodiorite is cut by aplite, granophyre, and graphic granite masses. Locally it is heavily tourmalinized with the formation of spherical rosettes of tourmaline and quartz as much as 5 in. in diameter. The Glory Hole Volcanics, Pinal Schist, and locally the Martin and Escabrosa Formations have been hornfelsed near the granodiorite. Along narrow zones and in breccia pipes the granodiorite has been altered to fine-grained aggregates of quartz and sericite. The granodiorite has a calculated age of 68 million years, based on K-Ar determinations on biotite (Creasey and Kistler, 1962), indicating a Late Cretaceous and(or) early Tertiary age. (See also Simons, 1964, p. 56-62, 127-131).

WILLIAMSON CANYON VOLCANICS (400 FT)

Massive, porphyritic to nonporphyritic andesitic breccia, agglomerate, tuff, flow, and flow breccia. The andesite is shades of red, brown, and gray. Phenocrysts are of plagioclase and hornblende. The phenocrysts and the fine-grained groundmass have been extensively altered (see Krieger, 1967b; named by Simons, 1964, p. 44-47).

GLORY HOLE VOLCANICS (0-1,000 FT OR MORE)

Tuffs, ash-flow tuffs, breccias, flows, and flow breccias, largely of dacitic and andesitic composition. Dominantly pyroclastic. The ash-flow tuffs are shades of gray, yellowish- and brownish-gray, with crystal, lithic (accidental), and vitric (pumice and shard) fragments. The typical streaky character of welded tuffs is still visible on weathered surfaces, even where hornfelsed. Flow breccias are light-olive-gray, porphyritic rocks with medium- , slightly bluish- or purplish-gray porphyritic fragments similar in texture to the matrix, but less altered. The phenocrysts are plagioclase, magnetite, and a little K-feldspar. Much epidote alteration has occurred in some areas. Hornfelsed rocks generally are medium dark gray to dark gray; the plagioclase is fresher looking. Along narrow alteration zones and in breccia pipes the volcanics have been altered to fine-grained aggregates of quartz and sericite (see Simons, 1964, p. 38-41, 127-131).

MESOZOIC(?) SEDIMENTARY ROCKS (0-40? FT)

Interbedded white to brown and grayish-red, fine- to very fine-grained sandstone and siltstone, containing abundant kaolinite, and variable amounts of goethite-hematite. (See Krieger, 1967b for more complete section.)

ESCABROSA LIMESTONE (300-500 FT)

Massive, cliff-forming, thick-bedded, mostly coarse-grained limestone in shades of gray and yellowish to greenish gray. The cliffs are separated by narrow slopes of thin-bedded, medium- to fine-grained, gray limestone and brown, silty, and dolomitic limestone; chert nodules are common in some beds. The base is crossbedded, coarse-grained, brown sandstone and dolomitic sandstone (0-10 ft), overlain by limestone that resembles beds near the top of the Martin Formation. Fossils are abundant and include crinoids, brachiopods, and corals.

MARTIN FORMATION (150-200 FT)

A slope-forming shale unit, generally with overlying and thinner underlying carbonate beds. The shale is olive to reddish brown, with interbedded reddish-brown and gray limestone beds (2 in. to 4 ft thick) in the upper part. These limestone beds weather to rounded surfaces that are light shades of brown and red. The top, in thicker sections, consists of as much as 50 ft of coarse-grained, light-gray Escabrosa-like limestone. Fossils in the limestone beds include brachiopods, bryozoans, and crinoids. The shale may rest directly on the Abrigo Formation, or be separated from it by a few of Abrigo-like carbonate. The base of the formation in most places is a few inches or feet of hematitic, in part oolitic, sandstone with granules and pebbles of quartz and abundant shark teeth (*Cladodus*) and teeth and dorsal spine fragments of an arthrodiran fish (*Ptyctodus* cf. *P. calceolus* Newberry and Worthen), according to F. C. Whitmore, Jr., and D. H. Dunkle (written communications, 1961 and 1962). The hematitic beds occur at the same horizon as the oolitic hematite beds in the Christmas quadrangle (Willden, 1960, 1964).

ABRIGO FORMATION[6] (ABOUT 500 FT)

Upper (or brown sandy) member (about 170 ft).—The upper part (about 100 ft) is slope-forming, thin-bedded (½-1 ft, locally 2 ft), medium- to coarse-grained dolomite and dolomitic sandstone in light shades of brown. It contains some argillaceous and glauconitic beds, intraformational conglomerate, irregular surficial chert, and a few thin chert beds and lenses. Silicified specimens of the brachiopod *Billingsella* (A. R. Palmer, oral communication, 1960) occur in a narrow horizon near the middle of the unit. The lower part (70 ft) is cliff-forming, dark-brown-weathering, thin- to thick-bedded (8 in. to 8 ft, mostly 3 ft), medium- to coarse-grained, mostly poorly sorted and crossbedded, dolomitic and glauconitic sandstone; some dolomite, sandy and glauconitic dolomite, light-colored sandstone and quartzite, intraformational conglomerate, and siltstone; local granule and small-pebble conglomerate beds. Phosphatic brachiopod scraps are generally abundant in the dark-brown-weathering beds. Fucoids and *Scolithus* occur in light-colored sandstones.

Middle (sandstone) member (about 270 ft).—Predominantly cliff-forming, yellowish-gray, thin- to thick-bedded (3 in. to 3 ft), mostly poorly sorted sandstone, and argillaceous sandstone; some granule conglomerate and thin to very thin silty or shaly partings. Most bedding surfaces are irregular due largely to abundant fucoids. *Scolithus* also are generally abundant. The upper part contains local beds of pronounced, steep crossbedding and 2- to 6-in. beds of white quartzite. Locally in the lower part a 10- to 40-ft massive unit has smooth bedding surfaces, no fossils, and only sparse shaly partings; it is overlain by 2-30 ft of mudstone-siltstone beds like those in the lower member. Contact with the lower member is arbitrarily located in some places and is not everywhere at the same horizon, partly because of variations in influx of sand in the upper part of the lower member.

Lower (mudstone) member (about 155 ft).—A thin-bedded, slope-forming, poorly sorted, argillaceous and sandy unit that weathers to shades of brown and yellowish or reddish brown. It consists of massive to very thin bedded (½-2 in.), in part thinly laminated, olive- to greenish-gray mudstone, siltstone, and sandy mudstone; interbedded argillaceous sandstone beds (1 in. to 1 ft and locally 3 ft) and thin (mostly about 1 in.) well-sorted, light-colored quartzite and sandstone beds, paper-thin shale, and local beds and lenses of granule to small-pebble conglomerate. The unit becomes more sandy and lighter colored upward. Most bedding surfaces are extremely irregular and pellety. Phosphatic brachiopod scraps are generally abundant; fucoids and *Scolithus* are present, but are mostly smaller and less abundant than in the middle member. The basal part is transitional into the Bolsa Quartzite.

BOLSA QUARTZITE[6] (10-160 FT)

Light-colored, color-banded, brown-weathering, thin- to thick-bedded (1 in. to 3 ft, rarely 10 ft), partly crossbedded and poorly sorted, gritty to fine-grained sandstone. The upper part (about 60 ft) is a very thin bedded to thinly laminated, well-sorted, fine- to medium-grained sandstone that grades downward into thin-bedded, medium- to coarse-grained sandstone. The lower part (absent in many places where underlain by Troy Quartzite) is thick- to thin-bedded (3 ft to 6 in.), medium- to coarse-grained sandstone with some gritty (granule) beds and angular fragments of Troy Quartzite. The base, where it rests on diabase, is very dusky red-purple to dusky and grayish-red conglomerate (as much as 25 ft thick) in a sandy matrix containing abundant diabasic detritus. Cobbles and small boulders are of Troy Quartzite and locally of older rock fragments.

DIABASE

Dark-gray to dark-greenish- or olive-gray, medium-grained diabase occurring mostly as sills and multiple sills (totaling more than 1,000 ft in places). The texture is diabasic, ophitic, or poikilitic. The rock contains plagioclase (mostly about 5 mm, locally 2 cm), smaller pyroxene (poikilitic crystals are as much as 2 cm across), magnetite, ilmenite, and minor olivine. Some thicker sills contain aplitic and pegmatitic differentiates. The chilled contact of diabase against older rocks (including earlier sills) contrasts with the weathered appearance of diabase beneath Paleozoic rocks, where, within a zone as much as 20 ft thick, diabase grades upward from fresh, massive, dark-gray rock into crumbly, red to purple rock with a pronounced platy structure.

TROY QUARTZITE[6] (0-730 FT)

Upper unit (0-520 ft).—White to very light gray, locally grayish-red, somewhat lenticular, thin- to thick-bedded (mostly 1-3 ft), feldspathic (white feldspar or clay alteration) to nonfeldspathic sandstone, quartzite, and granule to small-pebble

[6] For discussion of the Troy and Cambrian formations see Krieger (1961).

(less than ½ in.) conglomerate. Pebbles are composed largely of quartz; some are concentrated on tops of beds. The unit contains local slump structures and large-scale crossbedding. Surficial silicification obscures some bedding features.

Lower unit (0-210 ft).—Dark-brownish-gray outcrops of medium-gray to pale-red conglomerate and sandstone that are mostly thin bedded (many are 6 in. or less), lenticular, and channeled. The upper part consists of light-colored sandstone and quartzite interbedded with and replaced downward by dark sandstone, granule to small-pebble conglomerate, and thin beds of greenish-gray argillite. Much of the conglomerate contains abundant pink to orange fragments of feldspar and quartz porphyry or rhyolite. The basal 30-50 ft consists of pale-red sandstone and conglomeratic sandstone, in most places metamorphosed (by diabase) to light-bluish gray, underlain by pebble to small-cobble conglomerate that locally contains sparse to closely packed, well-rounded pebbles derived from the Barnes Conglomerate Member of the Dripping Spring Quartzite.

APACHE GROUP

Only the middle of the three formations that make up the Apache Group is present in the quadrangle.

DRIPPING SPRING QUARTZITE

Upper and middle members (10-150 ft).—The upper member is thin-bedded (¼-12 in.), very fine grained, feldspathic to arkosic quartzite and siltstone that are shades of gray, brown, red, and yellow. The middle member is thin- to thick-bedded (2-12 ft), crossbedded, medium-grained, locally fine- to coarse-grained, red to pink, feldspathic to arkosic quartzite, with a little nonfeldspathic quartzite. On the north side of the large granitic mass, the few feet of quartzite above the granite contain angular quartz and granitic fragments.

Barnes Conglomerate Member (0-10 ft).—Ellipsoidal, extremely well rounded pebbles (¼-6 in.) of quartzite, quartz, and red jasper, mostly closely packed, locally sparsely scattered, in a matrix of red to gray, arkosic sandstone or quartzite. Present only in the NE¼ sec. 29, T. 7 S., R. 18 E.; on Martinez Mountain, sec. 23, T. 7 S., R. 17 E., where it is overlain by a few feet of the middle member (unmapped); and north of the major fault, secs. 13-14, T. 7 S., R. 17 E.

GRANITIC ROCKS, UNDIVIDED

Composed largely of granodiorite or nonporphyritic quartz monzonite, and some alaskite. The granodiorite or quartz monzonite is medium grained (mostly less than 5 mm), pale red to grayish orange pink with olive-gray spots. Composed of saussuritized plagioclase (a few as much as 1 cm); K-feldspar, quartz, altered hornblende and biotite, and accessory sphene, magnetite, and allanite. Texturally the rock resembles neither the porphyritic quartz monzonite or the granodiorite in the Lookout Mountain quadrangle (Krieger, 1967c). The alaskite is medium to coarse grained and orange pink to pale red and contains microcline, plagioclase, quartz, and a little biotite, muscovite, and magnetite-chlorite alteration. Close to the pre-Apache surface the granitic rock is generally redder in color, richer in K-feldspar (in places to the exclusion of plagioclase), and poorer in mafic minerals, but this rock and the alaskite appear to grade down into the granodiorite or quartz monzonite.

PINAL SCHIST

Mostly flows, tuffs, and flow breccias of andesitic composition and some rhyolitic tuffs. The mafic flows and breccias are largely dark gray, greenish gray, and dusky yellow. The bedded tuffs are lighter colored, very fine grained rocks, some of which have been tightly drag folded. Most of the rock is nonschistose; locally a pencil structure has been formed by the intersection of two cleavages. The Pinal has locally been replaced by quartz and carbonate veins that contain tourmaline or pyrite, or by wide veins of dark-purplish-black quartz. North and south of Aravaipa Canyon, most of the Pinal is medium-gray to medium-light-gray, fine-grained, bedded quartz-sericite-magnetite rock with slaty cleavage. It contains some medium-dark-greenish-gray chloritic rocks, probably volcanic breccia, conglomerate, or mafic flow, and some massive pink rhyolite tuff or flow.

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