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GEOLOGICAL SURVEY

Preliminary geologic map of the Patillas and Guayama quadrangles, Puerto Rico

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GENERAL GEOLOGY

Rocks of the Patillas and Guayama quadrangles include a widespread sequence of dacitic and andesitic pyroclastic breccia and tuff, tuffaceous mudstone, and andesitic lava, mapped as Formation "A"; intruded by hornblende dacite of the San Lorenzo batholith, porphyritic quartz dacite, quartz diorite, granophyre, and hornblende-rich dikes; and overlain by Holocene colluvium and alluvium.

Formation A, in the mapped area, is in intrusive contact with the San Lorenzo batholith; its upper contact is not present in the Patillas and Guayama quadrangles. It is, however, present to the west in the Cayey quadrangle (Berryhill and Glover, 1960). The thickness of the formation may exceed three kilometers. Fossil collections from the Cayey and Comerio quadrangles suggest that formation A is of Early Cretaceous, possibly Albian, age.

The sequence of emplacement of the plutonic rocks is from mafic to felsic. The initial phase, hornblende diorite around the periphery of the San Lorenzo batholith, locally grades into quartz diorite. More commonly, however, quartz diorite intrudes the earlier hornblende diorite. Quartz diorite, which constitutes the bulk of the batholith, is variable in both texture and composition, and locally contains sufficient orthoclase so as to be classified as a granodiorite. The plutonic episode ended with local emplacement of small stocks and dikes of porphyritic granophyre, a rock notable for its association with deposits of disseminated copper sulfides elsehwere in Puerto Rico (Pease, 1966).

Other small bodies of igneous rock which post-date the batholith include dikes of quartz-dacite, hornblende-rich lamprophyre(?) dikes, and some fine- to medium-grained diabase dikes.

Hydrothermal alteration and the formation of disseminated pyrite and chalcopyrite(?) occurred during and perhaps slightly later than the formation of the granophyre.

The principal structure of the area is a broadly warped and faulted west-dipping monocline. Most of the faults pre-date the San Lorenzo batholith, and it appears that consolidation of the major plutons effectively diminished subsequent faulting in the central structural block of Puerto Rico.

ECONOMIC GEOLOGY

Mineral prospects located along a belt of hydrothermally altered and complexly intruded rocks trend about N45W from the margin of the San Lorenzo batholith in the vicinity of Patillas, as far west as Rio Cuyon near the town of Aibonito. This mineralized belt includes the Monte El Gato belt of hydrothermally altered rock in the Cayey quadrangle (Berryhill and Glover, 1960), and the hydrothermally altered quartz diorite stock along the Rio Cuyon in the Cayey quadrangle. Gold and copper are the most promising prospects along the belt, but traces of molybdenum and small deposits of magnetite and hematite are also known.

Areas suggested for additional prospecting

The Cacao - Yaurel area. -- This area is approximated by the margin of the pluton west and southwest of Lago Patillas. The batholith appears to be at shallow depth beneath the area; in the valleys of the Rio Rigua and its principal tributaries, the roof of the pluton has been breached.

Contact metamorphism has produced skarn and vein deposits of magnetite-hematite in the map area about 2 km south, west, and northwest of Cerro Piedra Gorda. In the Quebrada Majagual, magnetite-hematite-epidote-garnet-quartz replace the matrix and some fragments of dacitic pyroclastic ash flow deposits. Anastomosing veins of these minerals cut the volcanic rocks in many places.

Hydrothermal alteration probably followed the peak of contact metamorphism, and produced a northwesterly trending elongate body of altered rocks with abundant quartz, sericite and clay minerals. Opaque minerals, hematite, magnetite(?) and abundant pyrite occur as segragations of disseminated minerals which, upon weathering, produce the typical light-colored outcrops streaked with red, brown, and yellow. Locally veins of specular hematite are common.

A large mass of hydrothermally altered rock is shown on the map west of Patillas, and smaller unmapped areas occur throughout the Cacao-Yaurel area.

The westermost NNE-trending diabasic hornblende diorite dike just south of Cerro Piedra Gorda was apparently a local barrier to the migration of hydrothermal fluids. The porphyry on the west side of this dike is much more strongly bleached than that on the east. Small amounts of chalcopyrite and secondary copper minerals occur on the west side of this dike.

Granophyre, similar to that which forms the host rock of porphyry copper deposits in central Puerto Rico and elsewhere, occurs along the west side of the Rio Nigua.

Although the amount of iron ore in the Cacao-Yaurel prospect appears too small to be of economic interest, the area may warrant closer inspection for gold and possibly copper.

The western margin of the batholith from Lago Patillas to Charco Azul.--Patchy hydrothermal alteration of the pluton and adjacent volcanic rock is characteristic of this area. Two of the larger altered areas occur east of Escuela Lebron Ramos, and along the north side of the stream west of Escuela Francisco Zenon Gely. Disseminated sulfides and local veins of specular hematite occur in the hydrothermally altered rock.

Small amounts of granophyre occur along the margin of the pluton between the above named areas of hydrothermal alteration. The largest mass of granophyre discovered occurs near the north end of the prospect area just south of Charco Azul.

The area may warrent prospecting for copper and gold.

The Guamani area.--This area, in the southwestern-central part of the Patillas quadrangle, is centered over an apophysis of hornblende diorite. Disseminated pyrite occurs in the stock, and a conspicuous zone of hydrothermally altered rock occurs along the southwestern margin of that body.

The Guamani area forms part of the belt of altered rock, igneous intrusions, and mineral prospects extending from southeast of Patillas to the vicinity of Aibonito.

The area probably warrants additional prospecting for copper and gold.

Construction materials

Sand and gravel.--Large quantities of sand and gravel are available in the lower stream courses of the major rivers. Particularly coarse bouldery gravel occurs in the bed of the Rio Nigua.

Crushed stone.--Most of the unaltered and unweathered rock in the quadrangle is probably suitable for crushed stone. Around the margins of the pluton, well developed steeply dipping joints may facilitate quarrying operations by providing favorable directions of cleavage.

References cited

Berryhill, H. L., and Glover, Lynn III, 1960, Geology of the Cayey quadrangle, Puerto rico: U.S. Geol. Survey Misc. Geol. Inv. Map I-310.

Pease, M. H., Jr., 1966, Some characteristics of copper mineralization in Puerto Rico: Trans. of the Third Caribbean Geological Conference; Geological Survey Dept., Hope Gardens, Kingston 7, Jamaica.

DESCRIPTION OF MAP UNITS

Qap ALLUVIUM (HOLOCENE) - unconsolidated sand and gravel in alluvial plains

Qat ALLUVIUM (HOLOCENE) - unconsolidated sand and gravel in alluvial terraces

Qc COLLUVIUM (HOLOCENE) - unconsolidated sand and gravel

Qa ALLUVIUM (HOLOCENE) - unconsolidated sand and gravel, some clay in stream beds

Kha HYDROTHERMALLY ALTERED ROCKS (CRETACEOUS) -

Kh HORNBLENDE-RICH DIKES (CRETACEOUS) - possibly lamprophyres

Kg GRANOPHYRE (CRETACEOUS?) - porphyritic rock of granitic composition; contains phenocrysts of quartz and plagioclase in a graphic-textured groundmass, minor hornblende and biotite.

Kqd QUARTZ DIORITE (CRETACEOUS) - coarse-crystalline hornblende quartz diorite with varying amounts of biotite, pyroxene, and orthoclase, constitutes the bulk of the pluton.

Kqp PORPHYRITIC QUARTZ DACITE (CRETACEOUS) - as small stocks throughout Formation A

Khd HORNBLENDE DIORITE (CRETACEOUS) - coarse crystalline marginal phase of the hornblende-quartz diorite which constitutes the bulk of the San Lorenzo batholith.

Ka FORMATION A (CRETACEOUS) - pyroclastic breccia, tuff, and lava; locally with thin interbeds of mudstone. Clasts of feldspathic pyroxene andesite are abundant and clasts of dacite are common. Facies of the formation are informally divided as follows: abundant dacitic and feldspathic andesite breccia and tuff, common tuffaceous mudstone, Ka_3, feldspathic andesite lava and brecciated lava Ka_{3f}; abundant feldspathic andesitic lava and brecciated lava, pyroclastic breccia, rare thin- to medium-bedded tuff, feldspathic andesite lava and brecciated lava Ka_2, and breccia Ka_{2b}; abundant dacitic and feldspathic andesite breccia and tuff, common feldspathic andesite lava and brecciated lava, common tuffaceous mudstone, feldspathic andesite lava Ka_1.

CONTACT, dashed where inferred, dotted where concealed; all contacts of alluvium and colluvium are approximately located.

FAULT, dashed where inferred, dotted where concealed.

STRIKE AND DIP OF BEDS

Inclined