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Location and history of discovery

On May 31, 1989, Molycorp, Inc. (a wholly owned subsidiary of Unocal) and the Mescalero Apache Tribe announced discovery of a yttrium and zirconium deposit at Pajarito Mountain in the northeastern part of the tribe's reservation (Fig. 1). Discovery of the deposit was a result of Molycorp's exploration program of evaluating alkaline-rock occurrences in North America. Kelley (1968) described syenites at Pajarito Mountain and this publication led Molycorp to examine the area. The Pajarito Mountain area was sampled under prospecting permits from the Mescalero Apache Tribe in 1984. Subsequent geological mapping, geochemical surveys, mineralogical studies, and metallurgical tests defined target areas that were drilled in late 1985. No further work was undertaken on the property until a joint leasing–operating agreement was reached with the Mescalero Apache Tribe for development of the deposit.

Principal investigators contributing to the discovery and acquisition of the deposit were H. S. Jacobson, J. W. Keim, A. S. Levy, the writer, and consultant mineralogist A. N. Mariano.

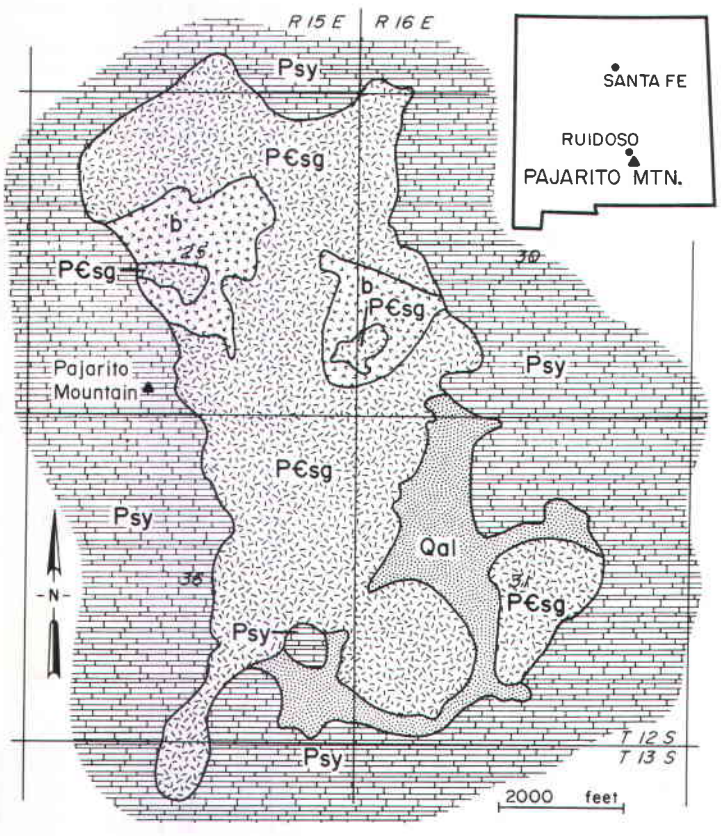

FIGURE 1—Location and generalized geology of the yttrium–zirconium deposit at Pajarito Mountain.

Geology

Precambrian alkaline rocks crop out in secs. 25 and 36, T12S, R15E and secs. 30 and 31, T12S, R16E (Fig. 1). Several varieties of syenite, quartz syenite, and alkali granite have been identified. Kelley (1968) reported ages ranging from 1,135 to 1,215 m.y. and Moore and others (1988) obtained an age of 1,150 m.y. for these rocks. All alkaline rocks analyzed by Molycorp and by Moore and others (1988) have alkalies $K_2O + Na_2O$ in excess of Al_2O_3. Essential minerals are K-feldspar, albite, quartz, and Na-amphibole. No feldspathoids have been observed. Eudialyte is the most abundant of the unusual and rare minerals found at Pajarito. Others include zirconium silicates, lanthanide minerals, and several yttrium-bearing phases.

Precambrian rocks are overlain by the Lower Permian Yeso Formation and San Andreas Limestone. Coarse clastic units of the Yeso Formation contain weathered fragments of Precambrian alkaline rocks. Sills and narrow dikes of olivine basalt intrude the Precambrian alkaline rocks. A few narrow dikes of basalt intruding San Andreas Limestone have been exposed in road construction.

Yttrium–zirconium deposit

Molycorp has announced a recoverable resource of 2.7 million tons with a grade of 0.18% Y_2O_3 and 1.2% ZrO_2. Yttrium and zirconium will be recovered from eudialyte: $(Na,Ca)_5(Zr,Fe,Mn)(Si_6O_{17})(O,OH,Cl)$, Vlasov (1966). Eudialyte is disseminated as a rock-forming mineral in syenites, quartz syenites, and alkali granites. Ore-grade material occurs at the surface and it extends beyond the areas drilled. The deposit will be developed by open-pit mining methods and the ore will be processed on site.

Molycorp is the only fully integrated producer of lanthanides. The Pajarito deposit provides a resource of yttrium, zirconium, and heavy lanthanide elements that will compliment Molycorp's lanthanide deposit at Mountain Pass, California. Molycorp currently produces high-purity yttrium from concentrates it receives from a joint-venture project in Canada at the Elliot Lake uranium mine, as well as other foreign sources.

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(*Contents on page 23*)

Stratigraphy and structure of the Klondike Hills, southwestern New Mexico

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Introduction

The Klondike Hills are in southwestern New Mexico approximately 30 mi (48 km) southwest of Deming, at the northwestern end of the Cedar Mountain Range (Fig. 1). They are characterized by low relief and complexly faulted Paleozoic carbonate rocks, although brecciation, dolomitization, and silicification locally obscure primary lithologies. The stratigraphic section includes Precambrian granite, Upper Cambrian to Pennsylvanian carbonate and subordinate clastic rocks, locally derived Upper Cretaceous/lower Tertiary conglomerate, Oligocene ash-flow tuff and rhyolite, and Quaternary colluvial and alluvial deposits. Laramide-style structural features include a high-angle fault with dip-slip and probable strike-slip offset, low-angle faults with both elimination and repetition of stratigraphic units, small-scale folds, and localized extensive brecciation.

Darton's (1916) geologic map of Luna County was one of the first to show Paleozoic rocks in the Klondike Hills. Bromfield and Wrucke (1961) further defined the ages of the Paleozoic rocks in their reconnaissance map (scale 1:62,500) of the Cedar Mountains (now called Cedar Mountain Range). Armstrong (1970) focused on the stratigraphy of the Mississippian rocks that form the northwestern end of the Klondike Hills. Attracted by the structural complexity of the area, Corbitt et al. (1978) mapped (scale 1:50,000) the southern two-thirds of the Klondike Hills. Thorman and Drewes (1981) mapped the Klondike Hills as part of the Gage SW quadrangle at a scale of 1:24,000. The objective of this report, based on the work of Rupert (1986) is to illustrate the complex structural relations exposed in the Klondike Hills at an even more detailed scale (1:8,000). With this, elucidation of Laramide structural history is somewhat better.

Stratigraphy

Precambrian

Medium-crystalline granite occurs in the west-central part of sec. 22, T26S, R13W (Fig. 2). The rock is intensely shattered, deeply weathered, mostly covered by alluvium, and forms topographically low poor exposures. One sample of the weathered granite yielded an Rb/Sr age of 1390⁺ Ma (M. Shafiqullah, written communication, 1983).

Bliss Sandstone

An incomplete section of Bliss Sandstone crops out south of the granite in the west-central part of sec. 22, T26S, R13W (Fig. 2). The base is not exposed and the uppermost beds are faulted against the overlying El Paso Formation. The Bliss includes about 10 m of dark reddish-brown, fine- to medium-grained, crossbedded quartz arenite in this outcrop. Many of the grains are frosted and the sand is cemented by silica, calcite, and minor hematite. ☞

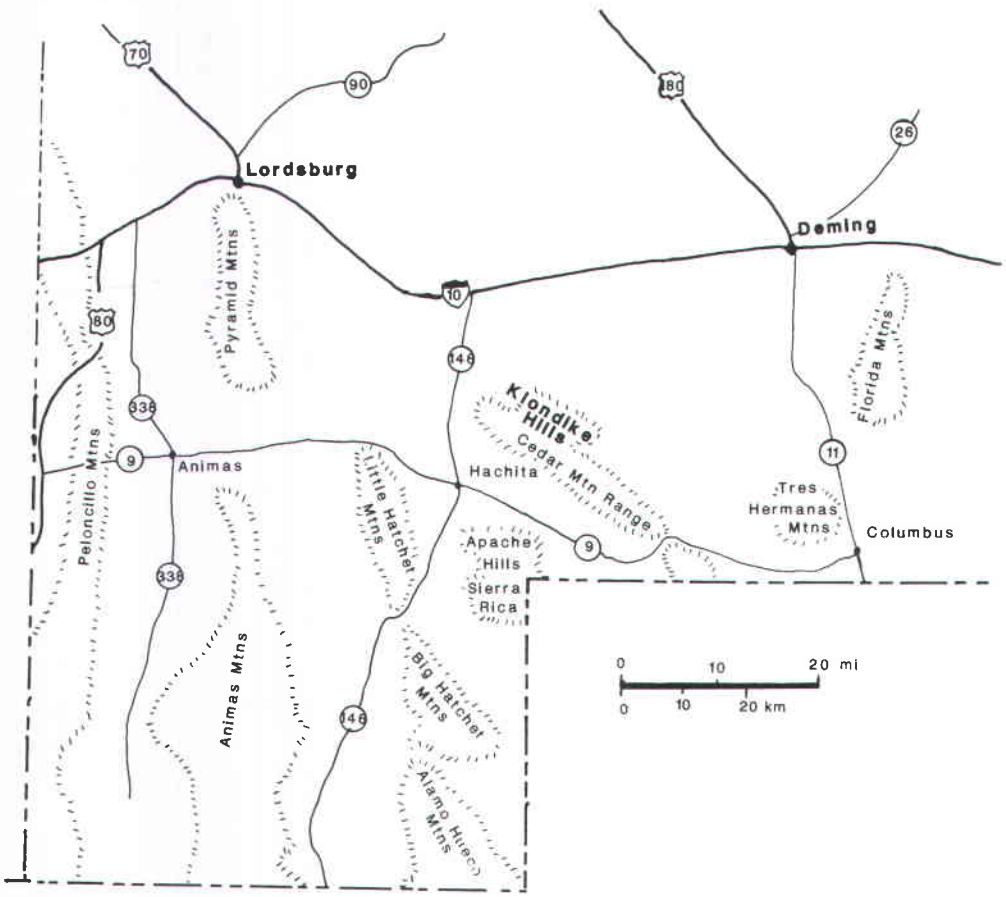

FIGURE 1—Location map of southwest New Mexico showing location of Klondike Hills area of Fig. 2.

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