LARGE SPHENE CRYSTALS FROM SAN JACINTO MOUNTAINS, CALIFORNIA

ROBERT W. WEBB,
University of California at Los Angeles.

INTRODUCTION

Large sphene crystals disseminated in plutonic rocks are not commonly found. Recently an area was discovered in the San Jacinto Mountains, Riverside County, California, in which numerous large crystals of sphene occur in grandiorite in sizes up to $1'' \times \frac{1}{2}'' \times \frac{1}{2}''$.

LOCATION

A few years ago a fine road generally known as the "Palms to Pines Highway," was completed across the San Jacinto Mountains, connecting Hemet, California, with Indio, in the Coachella Valley. This road opened up much country otherwise inaccessible. The sphene was found in exposures along this highway, approximately four miles toward Indio from a small roadside camp known as Ribbonwood. The locality lies on the northwestern side of Deep Canyon, in T. 6S., R. 5E., Sec. 36, Indio quadrangle.

DESCRIPTION OF THE SPHENE

The crystals are perfectly formed euhedrons, occurring separately and in groups, with individual crystals more common. Literally thousands of crystals of good size are obtainable without difficulty. The forms, as seen in the accompanying photograph (Fig. 1) are: $a(100)$, $c(001)$, $x(102)$, and $n(111)$. Examination of many perfect crystals and many fragments showed only these forms.

The crystals generally show small inclusions of feldspar and quartz. Microscopic examination of the individuals shows crystals of sphene completely enclosing andesine, which is commonly subhedral in relation to the sphene. They also enclose quartz, which occurs in anhedrons. Some of the sphene shows alteration to leucoxene.

The sphene occurs in an area within the large granitic batholith of the San Jacinto Mountains. The map of Fraser[1] shows batholithic rocks to the west, apparently the equivalent of those in which the sphene is found, which are classed as granites. The rock in the vicinity of the sphene locality is a granodiorite, varying to a microcline-quartz diorite. In

[1] Fraser, Donald M., Geology of San Jacinto quadrangle south of Gorgonio Pass, California: *Calif. Dept. Nat. Res., Div. Mines, Mining in Calif., State Mineralogist's Rept.*, vol. **27**, 494–540 (1931).

FIG. 1. Large sphene crystals from San Jacinto Mountains, California, showing occurrence of euhedrons, aggregates, and inclusions.

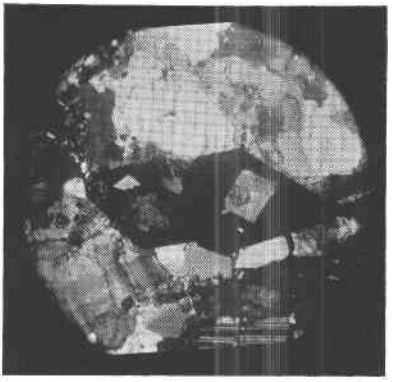

FIG. 2. Photomicrograph (×13) showing a large euhedron of sphene including subhedral andesine and quartz, from the microcline-quartz diorite of the San Jacinto Mountains.

the typical rock one to three per cent of sphene is common. Within an irregular area of several hundred square yards, high concentrations of sphene were noted with percentages running as high as five to ten per cent. In this area the large crystals here described were found. Deep

weathering of the feldspars of the country rock has caused excessive disintegration with the subsequent formation of a coarse soil in which the sphene crystals are disseminated, having resisted the attack of the desert agents. One is thus able to secure thousands of these crystals by either hand-picking, or sieving the top-soil. Where small swales are encountered, the top soil has been removed and one finds the sphene crystals particularly abundant, concentrated by the removal of the lighter weathered materials.

Origin of the Sphene

The occurrence of many grains of subhedral andesine and quartz included in the sphene crystals indicates a secondary introduction of titanium solutions into the granodiorite. The presence of accessory sphene in the rock in general and the textural relations of the sphene to minerals normally formed later, makes it improbable that the solutions carrying the titanium were original to the magma, but suggests that they were introduced from a secondary source after the partial or complete consolidation of the granodiorite. Field studies failed to indicate the source of the materials from which the sphene might have been derived. Further indication of alteration of the rocks in the sphene area is the presence in some places in the country rock of myrmekitic intergrowths.

CORRECTIONS AND ADDITIONS

W. T. Schaller, *U. S. Geological Survey.*

In the article on inesite in the January issue (vol. **24,** p. 26), Piedmont (Lake Crescent), Oregon, should read Piedmont (Lake Crescent), Washington.

An additional locality should have been listed for thaumasite on pp. 878–880 of the December, 1938 (vol. **23,** no. 12) issue. Professor B. S. Butler of the University of Arizona has called my attention to the description of thaumasite at the Lucky Cuss mine near Tombstone, Arizona.[1] The thaumasite "fills small fissures and replaces altered limestone. . . . The thaumasite is believed to have resulted from the action of hypogene sulphated waters upon siliceous limestone or upon calcium silicates previously formed by contact metamorphism." The localities in New Jersey still remain the only ones in which it can be shown that the thaumasite was derived from a sulphate mineral and such an origin, therefore, seems to be unique instead of a common one.

[1] Butler, B. S., Wilson, E. D. and Rasor, C. A., Geology and ore deposits of the Tombstone district, Arizona: *Bull.* **143,** *Geological Series 10, Arizona Bureau of Mines,* pp. 62–63 (1938).