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OCCURRENCE OF MULTI-FORM FLUORITE FROM MEXICO*

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The mineral collection of the United States National Museum contains many fine specimens from Las Chispas Mine, near Arizpé, Sonora, Mexico. Among them is a specimen of polybasite (U.S.N.M. R7867) weighing 82 pounds. Such a mass of polybasite is unique in its own right. However, disseminated throughout the mass are myriads of small fluorite crystals of such unusual habit as to invite description.

The mine which produced this specimen took its name from the fine "chispas" or crystals of silver minerals occurring there. Activity at Las Chispas Mine began in the 1880's. Because of poor mine management and extensive ore stealing, profitable operation did not begin until 1907. At that time the properties were incorporated as the Pedrazzini Gold and Silver Mining Company. (Russell, 1908). Extensive mine workings were eventually developed and fine specimens obtained for a number of years.

Dufourq (1910) describes the country rock as rhyolite which has been brecciated and re-cemented by secondary silica. Two rhyolite beds, varying in thickness from 300 to 400 feet, are separated by an altered volcanic tuff. The Chispas vein, filled mainly with quartz containing rhyolite fragments, lies along a small vertical fault. The ore body, apparently formed by secondary enrichment, continued downward to 900 feet below the outcrop. Below the 200-foot level mineralization consists of pyrite, polybasite, stephanite, argentite and small amounts of chalcopyrite. One stope described by Dufourq, after rising fifty feet and producing ore not assaying over eleven ounces of silver per ton, came suddenly into five feet of ore averaging two thousand ounces per ton across the entire face. This occurrence of bonanza ore zones was one of the unique features of the Chispas vein. A seven-foot thick vein mentioned by Dufourq contained a center band of pyrargyrite eight inches thick. On each side was a rib of quartz outside of which were two to three-inch bands of argentite mixed with quartz.

Because of the exceptional size and quality of the crystallized silver minerals, specimens from Las Chispas Mine are found in all the great mineral collections. Ford (1908) and Ungemach (1910) described the unusually fine stephanite and polybasite crystals from this vein. The 82-

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pound mass of polybasite in the United States National Museum probably represents the largest preserved as a single piece. It was assayed by the United States Mint at 16,868 ounces of silver per ton. The surface of the specimen has been dulled by oxidation but internally it is an open network of splendent polybasite crystals. Throughout the mass, crystal surfaces are partially covered with druses of well formed pyrite, chalcopyrite, quartz and fluorite.

The fluorite occurs in two generations, the first in spherical sub-parallel crystal aggregates and the last as limpid, highly modified individuals ranging in diameter from one-half to one millimeter. Under 30× magnification their beauty is most striking. The crystals show little or no malformation but their unusual clarity and high complexity makes visual identification of the faces difficult. A unique feature of most of the fluorite crystals is the occurrence, on a single crystal, of one each of all seven type forms of the hexoctahedral class.

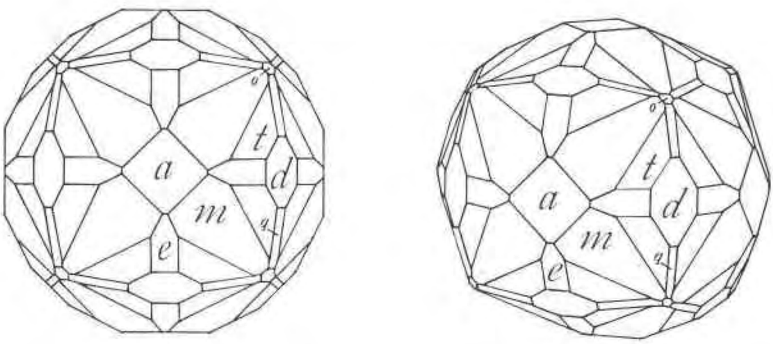

FIG. 1. Orthographic and clinographic projections of fluorite from Mexico.

Highly modified fluorite crystals are relatively common. Goldschmidt (1918) shows highly complex fluorites with a greater total number of forms but lacking at least one of the basic seven. In Shepard (1857) is a drawing of a Rossie, New York crystal having all seven forms but indices are not given. The forms appear to be different from those reported here and the crystal of a more usual habit with the octahedron dominant.

The appearance of a typical Las Chispas crystal, with practically no idealization, is shown in Fig. 1. Forms present are the cube (*a*), octahedron (*o*), dodecahedron (*d*), tetrahexahedron (*e*) {012}, trapezohedron (*m*) {113}, trisoctahedron (*q*) {133}, and hexoctahedron (*t*) {124}. The faces of {012} and {111} are always etched. The cube, dodecahedron and trapezohedron are about equally dominant with the other forms of lesser importance. The relative size of the hexoctahedron varies considerably. Similar crystals observed on other Las Chispas specimens had fewer forms. In every case, however, at least {100}, {110}, {113}, and {012} are present. Despite this variation the great majority of these transparent crystals show all of the holohedral isometric forms.

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AN INTERLAYER MIXTURE OF THREE CLAY MINERAL TYPES FROM HECTOR, CALIFORNIA

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The occurrence of mixed-layer clays in relatively pure clay deposits has been reported by various authors. Randomly interstratified mixed-layer silicates are found commonly as intermediate stages in the alteration of micas and other silicates to clay minerals. Random mixed-layer clays are minerals in which the layers occur in random intergrowth. A sample of clay from Hector, California, exhibits peculiarities inconsistent with existing data for the clay mineral hectorite. The clay is trioctahedral with an expanding lattice and has a pH of 9.8. In addition, the sample contains a small amount of calcite.

Because the description of the occurrence of such a material might cast some light on the genesis of the Hector deposits, and because of the possibility that the peculiarities attributed to hectorite might be the consequence of a polymineralic character in certain instances, the author believes the data presented herein are significant.

X-ray Analysis

X-ray diffraction curves of the basal $00l$ reflections are incompatible with a normal hectorite structure. By use of Ni-filtered Cu-radiation

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