

## Lorettoite discredited and chubutite reviewed

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### Abstract

Type lorettoite,  $Pb_7O_6Cl_2$ , has been examined and, on the basis of its physical appearance, associations, and total absence of any tie to a natural occurrence, the conclusion was reached that it is manmade. Therefore, the author proposed that it be discredited and the I.M.A. Commission on New Minerals and Mineral Names concurred.

When chubutite was described it was widely rejected as being identical with lorettoite. The description of chubutite has been reviewed, but no new information is provided. Even though its description makes it appear just as manmade as lorettoite, this cannot be substantiated in the absence of type material.

### Lorettoite discredited

Lorettoite,  $Pb_7O_6Cl_2$ , was described by Wells and Larsen in 1916. It was reported to occur "in honey-yellow masses made up of rather coarse fibers or blades" and to have "a very perfect basal cleavage." No details of the actual occurrence *in situ* are known, as the specimens were not collected by either Wells or Larsen but were sent to the U. S. Geological Survey by I. N. Wilconson of Loretto, Tennessee (the town after which the name was given), apparently for identification. If Wilconson commented upon the occurrence it was not mentioned by Wells and Larsen. It is highly unlikely that they would have failed to report any such information available to them. The only vague reference they made to the occurrence, and it is only speculation on their part, is the statement "The mineral is in flat, compact pieces, up to an inch thick, and apparently occurs in thin seams."

In 1917 the type lorettoite of Wells and Larsen was transferred to the U. S. National Museum of Natural History (catalog #93242), and more of the type material eventually was deposited at the same museum with the arrival of the Roebbling collection (catalog #R1388).

As of 1967 there were no published powder data for lorettoite, so the author prepared a pattern in anticipation of correcting this deficiency. The pattern produced using type lorettoite was found to match perfectly the data for synthetic lead oxychloride,  $\alpha - Pb_7O_6Cl_2$ , as given on ASTM Card 6-0393.

In examining the type specimen I observed that it has a very unnatural appearance. The flat mass of platy crystals not only lacks any discernible matrix, it also contains numerous small spherical cavities, appearing as though produced by gas bubbles. A polished section which included one of the opaque grains mentioned by Wells and Larsen was prepared. Microprobe analysis of the spherical opaque bleb showed that it consists only of metallic lead. The bubble cavities and the lead beads strongly reinforced my early reaction upon first examining the specimen, namely that the material cannot be natural and is, in fact, manmade.

It is most difficult to understand why Wells and Larsen did not mention the unnatural appearance, because it so strongly suggests that it is manmade. They did attribute a "cloudiness" and a low specific gravity (when compared with essentially identical material from California) to "minute gas cavities." It is interesting to note that this failure to introduce suspicion of lorettoite appears to have encouraged other liberties to be taken in reporting the associated species. The comments by Wells and Larsen, "The slight effervescence of the Loretto specimen with acids is due to a small amount of carbonate" and "a little of an opaque mineral, lead gray in reflected light, probably galena or metallic lead", became "OCCUR. With cerussite and galena(?) at Loretto, Tennessee." (Pallache *et al.*, 1951).

Immediate publication of these observations was

delayed as I sought to learn more about the geology and mining history of the Loretto, Tennessee, area and what uses, if any, this form of lead oxychloride might have had that would cause it to be synthesized.

At this same time (1967) Kent C. Brannock (now deceased), of Kingsport, Tennessee, made a prodigious effort to learn of any early lead workings in Tennessee in the vicinity of Loretto, which is in the south-central part of the state in Lawrence County, 13 miles SSW of Lawrenceburg. Brannock's efforts included discussions with Stuart Maher, Chief Geologist, Tennessee Division of Geology, and inquiries of the mayor and postmaster of Loretto, all to no avail. No knowledge of any early lead workings in the area was uncovered, nor could anyone shed any light on the whereabouts of descendants of Wilconson. Of course, Wells and Larsen never established that the material is actually from the Loretto area, so the failure of this effort may have no particular significance. The California lorettoite, alluded to above, has, if possible, even shakier credentials. To quote from Wells and Larsen "A specimen labeled 'massicot' without a location, in the collections of the University of California, differs in its optical properties from any known mineral." It, too, has the appearance of a synthetic and was described as "less clouded than that from Loretto, and basal sections show a delicate crossgrating at 90° due to the minute gas inclusions collected along certain planes."

The streak of lorettoite is a lively, pure yellow, which makes it a likely candidate for an early paint pigment and, in fact, it has been established that this form of lead oxychloride is widely known as a pigment under the names *patent yellow*, *Turner's patent yellow*, and *Montpelier yellow*. Harley (1970) reported that "patent yellow has good body and worked well in both oil and water colour but was soon injured by sunlight and impure air, and was, therefore, little used 'except for the common purposes of house-painting.' In spite of the introduction of other yellows in the nineteenth century, patent yellow was still made on a large scale."

However, even if not produced primarily for use as a pigment, its erratic distribution can be explained by virtue of the fact that it is a by-product of a simple process for preparing soda. Quoting Harley (1970) again: "A quantity of lead oxide . . . and half its weight of sea salt in solution were ground together and were allowed to stand for twenty-four hours, after which caustic soda solution was poured off, and the remaining white substance was calcined until it reached the desired shade of yellow."

Still another occurrence of lorettoite has been noted. This is a specimen from Burke County, North Carolina, but documents in the North Carolina State Museum (Raleigh) carry the notation "probably an Indian artifact insofar as it appears pitted and worked."

Therefore, it seems apparent that the evidence favoring a synthetic origin for lorettoite is overwhelming and that the name, as is herewith proposed, be discarded and lorettoite cease to be regarded as a valid mineral species. The burden of proof, clearly, is upon anyone who would argue that the name should be retained.

### Chubutite

Corti (1918), just two years after the description of lorettoite was published, described chubutite, a new mineral from "Las Coronas" mountain, Chubut, Argentina, a poorly defined lead oxychloride widely dismissed (Wherry, 1919; Spencer, 1919) as "evidently identical with lorettoite." Therefore, any attempt to settle the status of lorettoite must, it seems, also confront the problem of chubutite.

As near as I can determine, *type* chubutite has not been preserved. Attempts to locate a sample have been unsuccessful. Its formula,  $Pb_8O_7Cl_2$ , is nearly the same as that of lorettoite; its density (7.952) is a poorer match (Tennessee lorettoite 7.39, California lorettoite 7.56); and its crystallography is described as "tetragonal(?)." Unfortunately, in the absence of *type* chubutite, the composition and questionable tetragonality do not absolutely tie chubutite to lorettoite, the latter not being unique among known compounds in having the  $Pb_7O_6Cl_2$  formula, and lorettoite is not even tetragonal. It is orthorhombic, although *pseudotetragonal*, which suggests that the description of chubutite as "tetragonal(?)" may mean that it too is orthorhombic but *pseudotetragonal*.

There are two polymorphs of  $Pb_7O_6Cl_2$ , an alpha and a beta form. Lorettoite is the alpha form, and the crystallography of the beta form is not known. Chubutite may be identical to the beta form, and thus not the same as lorettoite. Furthermore, not being able to examine a sample of *type* chubutite, one must wonder if it, too, is manmade, particularly since it comes from a region in Argentina that produces both lead ore and salt. The description of Corti does not provide any particular support for a natural origin. No details of the provenance of chubutite, associated minerals, matrix, and such are recorded. In fact, the description creates many of the same doubts engendered by the lorettoite description. Corti's de-

scription is limited to "found in uniform radial masses, made up of dense accumulations of thick fibers limited by more or less perfect cleavages and showing no development of crystals." The comment of Lorenzo F. Aristarain (personal communication, 1979), "I saw the 'type material' at the mineralogical collection of the Secretaria de Minería; its shape reminded me of the bottom of a small laboratory crucible, furthermore with the naked eye I did not see other associated phases (or minerals)," indicates that chubutite is surely just as artificial as lorettoite.

The confused state of chubutite leads to an intriguing dilemma. If chubutite is the alpha form (lorettoite) and is of natural origin, then chubutite is a perfectly valid mineral. The name lorettoite, even with priority, would not be preferred because it was applied to manmade material. On the other hand, if chubutite is the beta form and of natural origin, chubutite, again, is clearly a valid mineral. Finally, if chubutite is not of natural origin, the mineral cannot be valid regardless of its crystallography and the name should be discarded.

Until type chubutite is located the matter cannot be resolved. The inferior character of the only published description of chubutite does, in my opinion, dictate that chubutite be relegated to the status of highly doubtful validity.

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