



RECENT DISCOVERIES
at the
JEFFREY MINE
ASBESTOS, QUÉBEC

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The Jeffrey mine in Asbestos, Québec, Canada, is world-famous for beautiful crystals of orange, pink and green grossular; vesuvianite crystals of many colors, as well as violet manganoan vesuvianite; and well-terminated crystals of prehnite and pectolite. It is also the type locality of spertiniite and jeffreyste. The locality is now closed to collecting, but in the last seven years there have been several isolated discoveries of significant and beautiful specimens.

INTRODUCTION

The Jeffrey mine in Asbestos, Québec, Canada, is a huge chrysotile mine which began operating in 1879. The mine is world-famous for beautiful crystals of orange grossular (see the cover of the *Mineralogical Record*, Vol. 24, No. 1); vesuvianite crystals of many colors, as well as violet manganoan vesuvianite; prehnite in prismatic, pyramidal and pseudo-cubic crystals and in globular form; and pectolite in well-terminated, white, translucent crystals.

It is also the type locality of the rare minerals spertiniite (named in honor of the discover, one of the authors, FS) and jeffreyste, first collected by one of us (FS). Only six very small specimens of jeffreyste exist. Five of them, weighing a total of five grams, are preserved in the collection of one of the authors (FS), and the remaining one is no. CNMMC48740HT in the collection of the Canadian Museum of Nature in Ottawa, where the species was characterized.



Figure 1. The Jeffrey mine in 1996. The arrow shows the location of the vesuvianite discoveries. Photo courtesy of JM Asbestos Inc.

During the 1970's and 1980's, specimens from the Jeffrey mine were fairly abundant on the mineral market, and the mine became famous particularly for its lustrous, gemmy orange grossular crystals. Unfortunately, the market for asbestos has been in crisis for several years, and the Jeffrey mine's ore production has been greatly reduced; consequently, good mineral specimens are no longer being found in such quantities as they once were. However, a few lucky discoveries have occurred during the last few years. Specimens from these discoveries, described below, may turn out to be the last major mineral specimens which will ever emerge from this very distinctive twentieth-century locality.

LOCATION AND GEOLOGY

The town of Asbestos is about a two-hour drive east of Montréal. The mine, which borders the town, is an open pit about 2 km in diameter and about 350 meters deep, exploiting a cylindrical orebody of asbestos (chrysotile). This orebody measures about 600 x 900 meters in the horizontal plane, and dips about 65 degrees to the southwest. From south to north, its constituents are pyroxenite, serpentized dunite and serpentized peridotite, terminating at a steeply inclined wall of slate which is reinforced by holes with steel cables. The degree of serpentization varies from 75% to 100%. The economically valuable asbestos-fiber deposits occur in the serpentized peridotite; the quantity of useful fibers in the dunite is too low to be profitable. The famous grossular garnets are found in fractures in red syenite and in the albitites and rodingites which are included in the dunite and peridotite. The vesuvianite crystals are found in a large rodingite dike enclosed in the dunite.

Very large dumps surround the mine. Many details are provided in a recent article by Spertini (2001); other information on the mine and its minerals can be found in Grice and Williams (1979), Amabili and Miglioli (2000) and in the book by Bancroft (1984).

DISCOVERIES FROM 1996 TO 1999

At the end of 1996 and during the first months of 1997, several good specimens of orange grossular were collected when active workings at the mine crossed a rodingite vein famous for hosting these classical garnets (workings are benched, and this vein is only crossed by a bench at intervals of several years). The average quality of the new grossular specimens is high, and there are some excellent individual pieces. However, the number of specimens produced is much lower than it was during periods in the seventies when the vein was crossed, as a consequence of the reduction in mining volume. One of the new pockets (actually a series of fractures in the rocks) produced a few spectacular specimens with large and clear crystals of very deep orange (almost red) grossular associated with acicular green diopside crystals, surpassing in beauty most specimens from the previous decade. This pocket yielded only five good cabinet specimens and two miniatures (plus some lower-quality specimens), which were collected by a miner operating a power shovel. All of the material collected from this pocket was sold by the miner to our friend Jonathan Levinger (a well-known collector and mineral dealer in Montréal) in August of 1997. One of us (MA) saw the material the same day, and would now like to thank Jonathan for letting him have (after a couple of years) the best small-cabinet (6.6 cm) specimen and the best



Figure 2. The Jeffrey mine in June 2003. The bottom of the pit is already flooded to a depth of about 300 feet. Amabili photo.

miniature (3.5 cm). These are world-class specimens, crystallized all around, with gemmy rhombic-dodecahedral grossular crystals measuring up to 2.5 cm on green diopside crystals. The other specimens were sold at the 1997 Denver show and are now in important private collections.

A memorable discovery was made at the mine on July 5, 1998, during a collecting day organized by the Club de Minéralogie d'Asbestos. On that day a few club members found the best pink grossular garnets ever collected at the mine. The lustrous, transparent crystals are floaters, or rest on green diopside or white albitite matrix. Such matrix is unusual for Jeffrey mine grossular, which is almost always found on dark syenite matrix (although some extraordinary orange grossular garnets on white albitite were found around 1972). Two of the authors (MA and FS), digging in the albitite rock, collected good specimens of pink grossular on green diopside; however, the pocket that made the day memorable was found in a large rock by a former Jeffrey miner, who immediately sold to one of us (MA) a large number of the pieces he had collected. The grossular of this pocket is very deep pink, and the crystals are up to 1.5 cm—much larger than the other nice pink grossular crystals collected on the same day and in the following weeks. These garnets are associated with a mineral of the wollastonite group, as masses of white fibers (the crystals were enclosed in these soft, fibrous masses, and thus were protected from damage during blasting and collecting). Other associated species on these pink garnet specimens are diopside, prehnite and (in only one specimen) apophyllite, as a single, sharp, cream-colored crystal of 2.7 cm. The material sold briskly on the local and international markets, although there were fewer than 15 specimens of very high quality. Pink grossular crystals from the Jeffrey mine are extremely

rare: no more significant specimens of this type have been collected since July 1998.

Unfortunately, in July 1998 most of the miners were dismissed from their jobs, and the asbestos production of the mine was greatly reduced. Since then it has become very difficult to find interesting specimens at the mine, although during the summer of 1999 a few very good specimens of white, colorless, or pale pink grossular crystals with green cores were collected. In the best pieces, there is a very bright green spot in the middle of each face of each crystal; the aesthetic effect created by these emerald-green spots regularly arrayed on the shiny crystals is really wonderful. The average size of the crystals is about 4 mm, but a single crystal 9 mm across is preserved in the collection of one of us (MA). In some specimens the grossular crystals are associated with cream-colored globular prehnite. Similar specimens were found in the past, but they are extremely rare, and not comparable in quality to those found in 1999. At the Denver show of 1998, Moore (1998) observed two older thumbnails of this kind of bicolored grossular from the Jeffrey mine; he described the “dreamy” effect that comes from seeing the green through the pinkish orange exterior. Most of the new specimens are small, but one measures 10 x 20 cm. During the same period, a few specimens of pale pink grossular crystals associated with prehnite were collected. The best of these crystals are a little larger than 1 cm, and are so transparent that the green diopside matrix showing through them makes them seem to have green inclusions.

Only rarely at Asbestos do diopside crystals reach significant dimensions when associated with grossular garnet crystals. In the few known specimens of this type, the grossular crystals rest on, and are partly penetrated by, elongated green diopside crystals.



Figure 3. Grossular crystals with diopside, 4 cm, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.

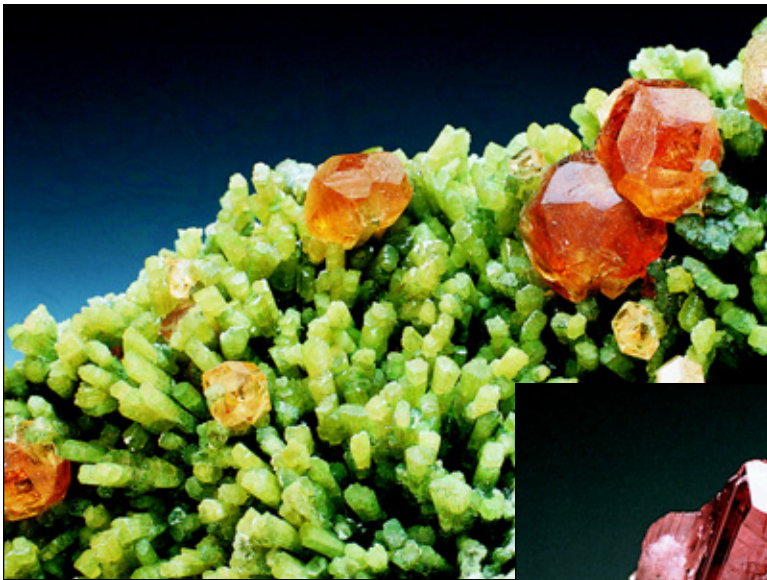


Figure 4. Grossular crystals on diopside, view as shown = 9 cm wide, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.



Figure 5. Huge transparent grossular crystal on matrix, 4.2 cm across, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.



Figure 6. Grossular crystals on diopside, 6.6 cm wide (largest crystal = 2.5 cm), from the Jeffrey mine, Asbestos. Amabili collection (ex J. Levinger collection); Jeff Scovil photo.

One of the best specimens was found in the mine dumps in May of 1999, when a mineral collector cracked open a large rock containing a cavity of 17 x 40 x 50 cm lined with green diopside crystals, some with orange grossular garnet crystals perched on their terminations. This discovery has been described in the *Canadian Rockhound* by the lucky collector (Roy, 2002). The best specimen collected is truly outstanding: it measures 7.5 x 15 cm, and displays 14 orange garnets up to 1.4 cm individually. This specimen recently entered the collection of one of us (MA).

DISCOVERIES FROM 2000 TO 2003

The only remarkable specimens found in 2000 are some very nice clusters of cream-colored, pseudocubic prehnite crystals to more than 1.3 cm on edge, associated with acicular white diopside crystals. In July 2001, a small pocket found at the bottom of the pit during mining produced some good specimens, including two miniatures with bright orange, trapezohedral grossular crystals to 2.1 cm with green diopside needles. Large trapezohedral crystals of grossular are less common than large rhombic-dodecahedral crystals at the Jeffrey mine.

At its birth in 1994, the Club de Mineralogy d'Asbestos obtained permission from the mine management to organize six collecting excursions to the mine between May and October each year (usually on the first Sunday of the month), and during these trips in 2002 the Club found that collecting was once again good. After 2001, because of the instability of the ground in most of the pit, the collecting area was restricted to a small safe zone in the upper east portion. In 1978 and 1988 there had been some important discoveries in this zone, at the mine's former 2440 level: purple, pink, yellow and green vesuvianite crystals were found in a rodingite



Figure 7. Grossular crystals on diopside, 5 x 7 cm from the Jeffrey mine, Asbestos. Back of the specimen shown in Figure 8. Amabili collection; Miglioli photo.

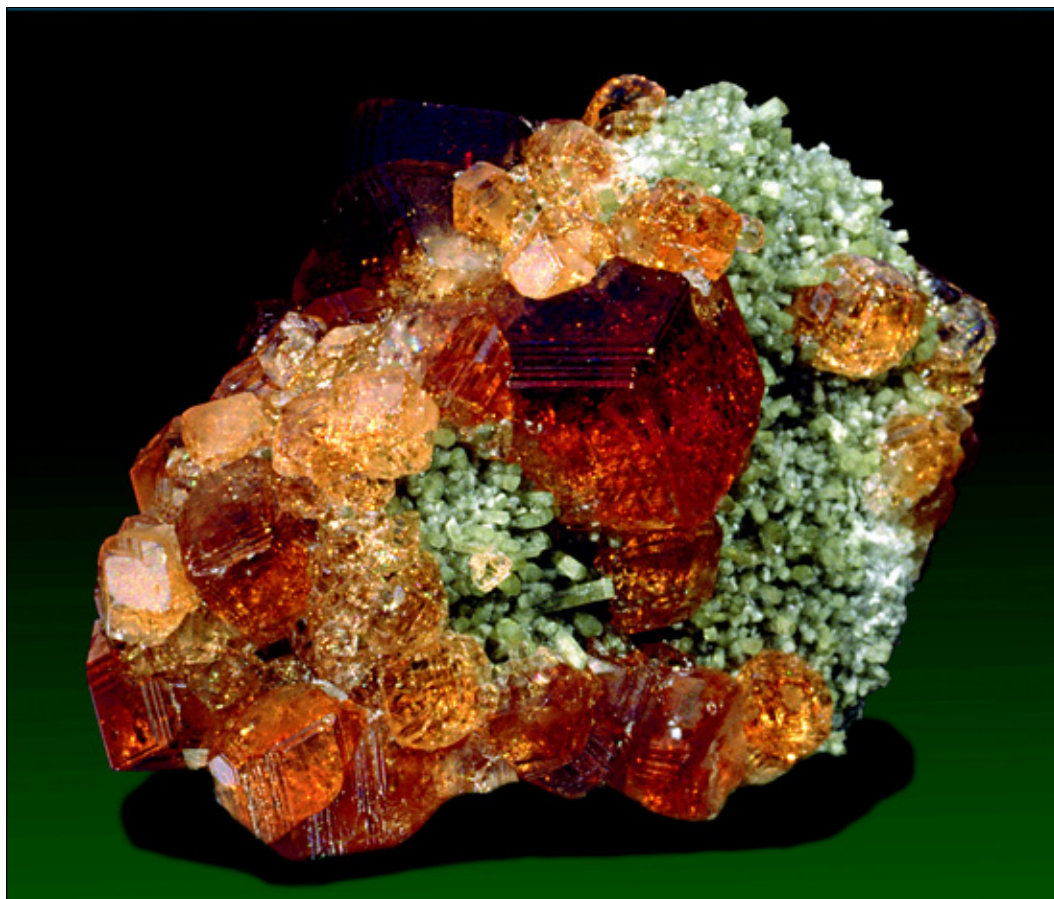


Figure 8. Grossular garnets on diopside, Jeffrey mine, Asbestos. Dimension 5 x 7 cm; largest crystal 2.5 cm. Amabili collection; Miglioli photo.

dike included in the serpentized dunite parallel to the huge shear zone that marks the south-east limit of the orebody (traces of purplish acicular crystals of vesuvianite were reported from this dike during geological mapping as early as 1950). During the 1980's this fine vesuvianite enhanced the fame of the Jeffrey mine: the best purple, pink and multicolored vesuvianite specimens collected then from the 2440 level are among the world's best for the species. In 1988, when the mine was last expanded, the roots of this dike were covered over, and it is only because of sliding of the ground that part of the dike had become accessible once again in 2002. The exposed section, immediately beside a secondary mine road, is a safe, easy site for digging.

During the May 2002 excursion, in awful weather conditions, some nice clusters of pink and purple, transparent crystals of vesuvianite were found. The best specimens have crystals with very shiny pink terminations and transparent, pale-green prism faces. In fact, during each visit in 2002 there were interesting discoveries, which inspired the enthusiasm of the collectors. A few spectacular, deep green crystals (the color can vary between emerald and diopside-green) of chromian vesuvianite up to 4.4 cm long and almost 1 cm wide (now in the collection of MA) were found in July and August. The best specimens are single, loose, translucent crystals, some with small gemmy areas. Deep green vesuvianite specimens are extremely rare, and those collected in 2002 are probably the best ever found. They were collected from small vugs in a thin, emerald-green vein of massive vesuvianite embedded in the main, pale-green vesuvianite vein.

The excursion on August 25, 2002 proved especially lucky for



Figure 9. Grossular crystals with diopside, 5 cm tall, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.



Figure 10. Transparent grossular crystals with emerald-green cores; picture area about 4 x 6 cm, from the Jeffrey mine, Asbestos. Amabili collection; Miglioli photo.



Figure 11. Pink grossular crystals on diopside, 3 x 5.5 cm with crystals up to 1 cm, from the Jeffrey mine, Asbestos. Amabili collection; Miglioli photo.

two collectors who recovered from a large pocket more than 100 specimens of yellowish green vesuvianite (some crystals having purple cores), including a cluster of doubly terminated crystals to 3 cm long and 1 cm wide individually. The specimens are of thumbnail, miniature and cabinet size; the largest measures about

25 x 35 cm. The pocket in the green vesuvianite vein was filled with fine granular vesuvianite, and the collected specimens are virtually floaters. In the following weeks, some miners collected more top-quality specimens in the same area by using a power shovel, until the management of the mine decided to bulldoze over

Figure 12. Pink grossular crystals on diopside, Jeffrey mine, Asbestos; back of the specimen in Figure 11. Amabili collection; Miglioli photo.



Figure 13. Pink grossular crystals, 6 x 11 cm with crystals up to 1.5 cm, from the Jeffrey mine, Asbestos. One of the best specimens collected on 5 July 1998. Amabili collection; Miglioli photo.



Figure 14. Emerald-green vesuvianite, 4.4 cm long, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.



Figure 15. Emerald-green vesuvianite, 2.6 cm tall, from the Jeffrey mine, Asbestos. Amabili collection; J. Scovil photo.



Figure 16. Cluster of "violet cup" vesuvianite, 10 cm wide, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.



Figure 17. Green vesuvianite crystals to 4.2 cm tall, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.



Figure 18. Deep violet vesuvianite, 6 cm, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.



Figure 19. Multicolored vesuvianite, 12.6 cm wide, from the Jeffrey mine, Asbestos. Amabili collection; Appiani photo.

Figure 20. Cluster of “violet cup” vesuvianite, 7 cm, from Jeffrey mine, Asbestos. Amabili collection; Appiani photo.



the collecting site. A few of the specimens collected—for example, a spectacular 12.6-cm cluster of partially gemmy, purple-yellow-green vesuvianite crystals, with a very sharp 1.4 x 1.6 x 6-cm multicolored crystal with modified flat termination rising from it (MA collection)—are surely among the best vesuvianite specimens ever found at the Jeffrey mine. Prismatic, pale green vesuvianite crystals with deep purple, extremely shiny, flat terminations are classic for this locality but have always been rare—they are familiarly called “purple-cap” vesuvianite. Our favorite specimens of this type are those collected by one of us (FS) in 1978, and a few collected in September 2002, including a spectacular 8 x 10-cm specimen crystallized all around, with crystals (some doubly terminated) up to 3.4 cm, in the collection of one of us (MA).

Also during these weeks of intense collecting between August and September 2003, specimens showing forest-green vesuvianite crystals with pointed terminations were found; some are elegant clusters and isolated crystals up to 4.5 cm long. The same collecting area produced a 6-cm group of remarkable deep amethyst-colored vesuvianite crystals. It is very surprising that the morphology and the color of vesuvianite vary so dramatically in the specimens from the Jeffrey mine, considering that all the specimens have been collected in the same area, which is only about 40 meters long. Pockets only a few centimeters apart can contain crystals of different forms and/or colors. The vesuvianite is accompanied rarely by transparent, colorless diopside in tabular crystals to more than 1 cm, and by small, black needles of groutite or small prisms of manganite. Small masses of native copper and chromite found in the same zone may show small blue spots of spertiniite on the copper, but are never directly associated with vesuvianite. Grossular garnets have never been found in this collecting area, although they are found at many other sites in the mine.

A large number of newly collected vesuvianite specimens were sold at the Tucson show in February 2003. An exhibit of some of the best specimens (grossular and vesuvianite) collected at the Jeffrey mine in the last few years was presented by one of us (MA) at the 2002 Munich show, where it was noted by Bill Larson (2003).

Vesuvianite specimens were also found in the spring and sum-

mer of 2003, but in much smaller numbers than in the previous year, and only three or four specimens from these most recent discoveries are of very high quality. However, some interesting specimens showing associations of tabular diopside crystals, and a 4-cm group of deep-green chromian vesuvianite crystals with beautiful pointed terminations, must be mentioned.

PRESENT MINING STATUS

For the past several years, the decline of the asbestos market precluded planning for any major expansions of the Jeffrey mine pit. Indeed, open-pit operations have become more and more limited because of several negative factors: there is almost no space for further lateral expansion, since houses already exist almost on the lip of the pit; the present workings are unstable; and it is too expensive to remove the huge quantity of overburden above deeper levels of the plunging orebody. The reduction in ore output during these recent years has had to be compensated for by taking ore from stockpiles.

In 1996 new underground workings were sunk into the richest portion of the orebody, and this portion of the mine was scheduled to go into production sometime between 2003 and 2004. However, because of financial problems, development of the underground workings was suspended in 2002, and there are currently no plans to go forward with it.

In October 2002 the Jeffrey mine was closed, reportedly because the mining company had gone bankrupt. A NASA contractor made an arrangement with the mine management to reopen the mine for four months to obtain asbestos for the space shuttle (seals on the shuttle are made with asbestos of special quality from the Jeffrey mine), but in April 2003 the mine closed again and there are now no signs that it will reopen in the foreseeable future. When mining ceased, so did the pumping of water from the bottom of the pit; by July 2003 the pit was flooded to a depth of almost 100 meters, and the best collecting areas for grossular garnets were underwater.

COLLECTING

Collecting by the public has always been forbidden on the mine property. Nevertheless, special guests, university students and



Figure 21. The location of the vesuvianite discoveries during the excursion of July 6, 2003. Amabili photo.

scientists were admitted quite regularly and were escorted around the mine by staff members. Workers, despite being officially forbidden to collect minerals, began collecting assiduously in the 1960's, when the demand for mineral specimens (mainly grossular) created a lucrative market.

For 25 years the mine management maintained a "mineral site," freely accessible to the public, close to the mine installations. During many of these years one of us (FS) supplied the site with specimens every time some interesting mineral occurrence showed up in the mine. Rocks of potential interest for collectors were trucked to the site instead of to the mine dumps, and the operation made countless visitors happy. Today the site is still open, but no new material has been added to it for a long time.

The only way to receive permission to collect in the mine itself has been to join the mineralogical club of Asbestos and to take part in its summer excursions to the mine. Since the open pit is now closed, it is not clear whether collecting excursions by the club will

be allowed in the future; the last such excursion took place in August 2003. Since there is now widespread slumping in the open pit, the directors of the mineralogical club of Asbestos decided to stop collecting at the mine because the risk is too high. It is unclear whether collecting at the Jeffrey mine will ever be possible again.

ACKNOWLEDGMENTS

We wish to thank the former miners of the Jeffrey mine who collected with great skill the wonderful specimens that make this locality world-famous. Among them, we thank in particular Alain, Denis, Michel, Normand, Réjean, and Renè, who spent collecting days with us at the mine and have contributed so much to our collections with their discoveries. We wish to thank also our friends Celestin, Claude, Daniel, Jonathan, Marc, Natalia, and Paul-Émile for contributing so much to the development of our Jeffrey mine collections. The wonderful photographic work of Roberto Appiani and Jeffrey Scovil and the editorial help of Tom Moore are also acknowledged.

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