

The Little Gem Amethyst Mine, Jefferson County, Montana

– Supplementary Material –

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This supplementary, on-line document, for which the internet link is shown in the magazine article, describes major pockets from the Little Gem mine. The figures referenced here are those in the article, with the exception of three specimen photographs which are included in this document (figs. 41-43).

Major Pockets

Many hundreds of individual pockets of significant size have been found from late 2009 through 2018. Major finds include pockets or pocket zones that are most notable for their size or the specimens that they produced. These include the following pockets, with the month in which they were opened: Ladder pocket (December 2009), T-Day pocket zone (November 2011), Fairy Castle pocket (August 2011), Winter's Day pocket (January 2014, the largest single cavity yet found), Mongo pocket (March 2015), Taylor pocket zone (July 2015), Chimney pocket (March 2017), Harvey Hole pocket (April 2017) and Rocky Top pocket. All except the Chimney pocket are located on the sketch shown as figure 7 in the article. Each of these pockets is described here.

Ladder Pocket

Shortly after purchasing the mine in December 2009, the author explored Jerry Gray's pay-drift. Most pockets had been picked clean, but probing the seams in the walls led to the discovery of several good pockets including the Ladder pocket. A small crack behind the ten-foot ladder to the upper hatch was widened for eyes to peer in. Many crystals could be seen in what became a 0.6 meter-wide by 0.3-meter high by one meter-long pocket. A little more chiseling allowed entry of a nervous hand to extract the first crystal. This is the textbook example of a scepter, 6 cm tall with a 2.5-cm, nicely symmetrical, grape-jelly color cap, gemmy and lustrous, with a sharp termination. The 5-cm stem is jet-black and glassy. It is pictured in figure 22. Many thousands of

crystals later it remains superior to the next best specimen. The even shakier hand reached back into the pocket for more. This second crystal was a 7.5-cm by 10-cm amethyst "point" (prismatic crystal with a simple termination) with a dozen more points attached, but unfortunately the main tip was broken off. The pocket continued to yield crystals over the next month until there remained a single sceptered crystal that was firmly attached to the roof of the pocket at the very back. Despite many hours spent enlarging the pocket, its removal was deemed impossible without damage, and recovery efforts were suspended for two and a half years.



Figure 41. Quartz specimen, from the sub-basement zone of the Fairy Castle pocket, weighing 23 kg. The main crystal is 35 cm long, mostly colorless and gemmy, with a flat sidecar overgrowth plate of light-amethyst jasper. Russ Hage specimen, on loan to Montana Tech Museum. Mike Menzies photo.

On May 20 2012, while mining from the surface, the Ladder pocket was exposed and this crystal was finally within reach. While carefully protecting the crystal, the lead author gently pried on the aplite slab complete with its scepter, until it fell safely into his hand. It remains (now trimmed and cleaned) the author's premiere matrix specimen from the mine (fig. 21).

T-Day Pocket Zone

In September 2011, Bob Jackson, of Spruce Ridge, Washington fame, drilled and shot a series of holes parallel to and east of the pay drift. Weeks of hand digging through the blasted rock resulted in finding the initial pocket in the T-Day (Thanksgiving Day) zone on November 25. This series of productive pockets was hosted in veins of pegmatite that had intruded a volume of aplite 6 by 9 by 3 meters. The larger pockets occurred in bulges in the veins. At the north end of the zone, a very large pocket (one meter across) was found enclosed within the aplite. The pay zone was seen to be running uphill under the main muck pile and mining was halted for safety reasons pending muck removal. Many hundred amethyst specimens to over a foot long, including the one pictured in figure 25, were harvested from this zone. The best specimens were mostly amethyst scepters and there was no jacaré. The microcline in these pockets was not corroded and some pockets had intact hanging walls with up to a dozen amethyst scepters still attached, but it was uncommon to find such crystals on the footwalls. Production from the T-Day zone continued until mid-summer 2012.

Fairy Castle Pocket

While awaiting Forest Service approval of the POO, the lead author and friends mostly worked the tailings because little native pegmatite was exposed. On August 1 2011, Brad Somers rolled a boulder high up on the northwest corner of the mine, just west of the exposed pegmatite. This revealed what appeared to be weathered granite, but there were also some crystal shards, and digging exposed crystal-bearing pegmatite. Here lay the Fairy Castle pocket, named for the unique crystal habits of its amethyst specimens. The pocket had no distinct boundaries save for the footwall which was nearly solid smoky

quartz with a few crystal faces. On the north side of the pocket was a band of altered feldspar with islands of amethyst scepters that produced about 50 exceptional specimens. The crystals were mostly scepters to 20 cm long with colorless stems, light amethyst caps that have a definite "hot pink" hue and, for Little Gem, especially lustrous faces. The main pocket was filled with decomposed granite, chunks of feldspar and quartz shards.

A dozen large scepters, individually up to over 20 kg in weight, were recovered from this pocket. Most scepter heads are colorless to very light pink. Mining operations in mid-2015 were 3 meters below this pocket. There appear to be pocket-bearing layers of rock extending downwards separated by layers of bull quartz. Crystals from each pocket layer have markedly different habits. Figures 40, 41 and 42 show three large specimens from this pocket.



Figure 42. Large group of smoky quartz crystals, 33 cm high, from the sub-basement zone of the Fairy Castle pocket. There is a notable absence of amethyst on such a large specimen. Russ Hage collection, on loan to Montana Tech Museum in Butte, Mike Menzies photo.

Mucking resumed in late summer 2012. During tramming of muck to a repository west of the pegmatite, a previously unknown pay zone was exposed west of the pay drift. This new zone had the appearance on the surface of weathered granite, but one crystal led to another and mucking was temporarily halted in order to investigate further. The zone skirted 6 meters west of core and extended 15 meters north to the granite contact. There were few distinct pockets and instead crystals were found in a mixture of weathered granite and feldspar and quartz shards. This pay zone wraps around the northwest corner of the core and grades into true (coarse-grained) pegmatite on the east side. The pockets occurred in pegmatite in the contacts between the feldspar and quartz and in the feldspar, with few found in the quartz. They were still intact and ranged in size from an inch across to 6 feet across and up to 5 feet high. This pay zone west of the core ended up being 6 meters wide by 15 meters long up to 3.5 meters thick. Notable finds included a 1-meter by 35-cm, terminated crystal of milky quartz and the specimen pictured in figure 40. There were also many loose scepters to 50 cm long, many jacaré amethyst overgrowth specimens to 50 cm, and dozens of buckets of colorless quartz plates. These quartz plates have been overgrown by flat-laying quartz crystals, in some specimens on both sides.

Winter's Day Pocket

In late September 2013, Bob Jackson arrived to blast a cluster of large boulders lying above the pegmatite that presented a hazard. A few of the boulders were reduced to manageable sizes before drilling of the largest (6 meters long) which was found to be unstable and slowly sliding downhill. All work around this potential "widow-maker" was suspended and activity was restricted to the northwest corner of the pegmatite. This is an area of true pegmatite of very coarse texture with very large, intergrown feldspar and quartz crystals. Numerous small pockets were found until early January 2014. The lead author worked a soft area for several hours that produced only gallons of green pocket mud and only one 15-cm shard of smoky quartz before he found the first amethyst crystal. This was the gateway to the Winter's Day pocket. It was a secondary pocket, and

by far largest single cavity yet encountered at the Little Gem. Two months of effort by two diggers working three days a week yielded many dozens of jacaré amethyst overgrowth specimens and hundreds of amethyst scepters to 15 cm in size.

The pocket showed distinct intact sidewalls, a footwall, and a hanging wall and measured 2 by 2 meters and about 1.25 meters high. It also had offshoots and small chambers in all directions and many smaller pockets were found within a few feet around it. No crystals were found attached to any of the walls. In late March 2014, a 2.5-cm bug-hole on the edge of the main pocket yielded the first two (very small) schorl crystals from the mine. A pocket in the same area produced three partial cubes of altered pyrite 5 to 7.5 cm on a side. The Winter's Day pocket also produced an outstanding 5-cm-long "dumbbell" scepter (a quartz stem sceptered with amethyst at both terminations); this is one of just a few such specimens from the Little Gem.

Mongo Pocket

As mining progressed to the east in this same level, two further major finds were made. The first was the Mongo pocket, opened on 19 March 2015. It was a secondary pocket, about one meter by 0.3 by 0.3 meters, and filled with pocket mud, shards of feldspar and a few shards of quartz. Despite its modest size, it was very productive, yielding four amethyst scepters to 13 cm in size and of excellent quality, and two large, extraordinary specimens (figs. 3 and 43).

Taylor Pocket Zone

The second, the Taylor pocket zone, opened in early July, 2015 and worked through into 2017, still has the potential to extend further into the hill below the high wall. It was named for Taylor McGarrigle, an Arizona collector. It stretches for up to 5.5 meters along the working face, 2.5 meters into the hill, and is up to 1.5 meters thick.

A 1.25-meter-thick layer of vuggy aplite that forms the roof has an underside that is dimpled with casts (voids left by quartz crystal bases), but there is still a few attached quartz crystals and also some sharp faces of feldspar crystals. A few small amethyst-bearing

pockets were found in the area of the upper aplite-pegmatite contact. Some jacaré quartz has been found attached to the quartz walls of individual pockets.

The pocket zone represents a very large network of primary and secondary cavities ranging from thumb size to 0.3 meters across, which likely were all interconnected. Crystal specimens show striking common characteristics, including exceptionally complex morphology and grape-jelly color (in the lead author's opinion, the best amethyst color from any area of the mine).



Figure 43. This complex specimen, from the Mongo pocket, is 40 cm long, and consists of crystals of smoky quartz and amethyst on a matrix of bull quartz. Note the large amethyst scepter growing from the middle of the specimen. There is good development of amethyst jacaré and also clusters of flat-lying, doubly-terminated crystals, some of which are sceptered. Small areas show partial overgrowths of late-stage tan to gray quartz. Russ Hage collection, Mark Mauthner photo.

These pockets have yielded a bonanza of quartz crystals - many thousands in number, some truly exceptional. Some of the best specimens consist of clusters of intergrown scepters (some with four crystals, exceptionally with as many as eight); there are also clusters of non-sceptered crystals. Production included many hundreds of amethyst scepters up to over 40 cm in length, and some of the smaller cavities had an abundance of very small (3- to 25-mm) scepters. Hundreds of jacaré amethyst plates to 25 cm in maximum dimension have also been recovered. Many specimens show fingerprint texture. This zone has also produced the best yet yield of some of the rarest type of specimen from the mine, including more than a dozen small scepters on feldspar matrix and ten dumbbell scepters. The best specimen (fig. 29) consists of four 2.5+ cm, pristine crystals aesthetically arranged with some matrix; these crystals show grape jelly amethyst color, good luster and high internal quality. The lead author considers this to be one of the best quality specimens from the Little Gem. This pocket zone also produced an uncommonly high proportion of superior cutting rough.

Chimney Pocket

This pocket (not shown in figure 7, because of insufficient room on the sketch) was just west of the Rocky Top pocket. It was opened in early March 2017 as the first major pocket in current phase of mining in the lower workings. The pocket had an uncommon tubular form, occupying a length of 3.5 meters aligned with the system of joints in the aplite, and was 0.6 meters wide by 0.3 meters high. It was a secondary pocket, filled sericite mica and chunks of microcline. Quartz crystals were found loose concentrated in "islands". In the lower portion were crystals of amethyst up to 5 cm in size, in upper portion there was less sericite, but larger crystals, including the Peacock scepter specimen (fig. 4). There were no amethyst crystals still on matrix.

Microcline showed unusually good crystal form but strong etching. This has been the only significant pocket to date to have abundant albite, as aggregates of small, well-formed crystals, mostly intergrown with larger crystals of microcline.

Harvey Hole Pocket

This was in the lower workings, close to both the Chimney and Rocky Top pockets. All three of these large pockets were secondary, and their long axis was aligned with the system of joints in the aplite. The Harvey Hole was, however, a group of pockets, overall at least 3 meters long and about 2 meters wide, with the largest individual pocket more than a meter in maximum dimension. It was opened on 14 April 2017 and excavated over a period of several months. When first opened, at the lower extremity of the pocket zone, all that could be seen was pocket debris that had come in from above. As is the case for many secondary pockets, removal of the debris zone exposed a layer of sericite produced from corrosion of overlaying crystals of microcline. This sericite layer provided a welcome surprise, a total of thirteen amethyst scepters, all of very high quality! But the best was still to come. At the top of the pocket zone, large, somewhat corroded crystals of microcline were encountered, and some of these formed the matrix for one or more amethyst scepters. One exceptional specimen has five amethyst scepters! Specimens of corroded crystals of microcline were abundant on the roof of upper portion of the pocket zone. On some

specimens, there were also groups of lustrous white crystals of albite.

Rocky Top pocket

This exceptionally large pocket, opened on 7 July 2017 was one of the best ever found at the mine. It measured 3.5 meters long by 1.25 meters across. Despite its size, it took only for days to extract the contents. Specimens were found mixed with chunks of quartz and feldspar, and were concentrated in three areas. This pocket was also exceptional for the number, large sizes and quality of specimens, all of which had formed on the pocket roof (fig. 17); many of these were recovered on matrix, typically aplite. These included many amethyst scepters (fig. 28) and abundant parallel-growth groups of crystals of quartz (mainly amethyst). The loose pocket contents included abundant quartz crystals (mostly smoky), but very few scepters. Microcline was common as loose crystals and groups, showing uncommonly good crystallization, but with varying degrees of corrosion. Well-crystallized albite was less common than in the Chimney and Harvey Hole pockets, in groups of sharply crystallized, lustrous white crystals, some intergrown with much larger crystals of microcline (fig. 34).