Figure 10: A 203.41 ct phenakite from Madagascar is shown together with another large phenakite (105.74 ct) that reportedly came from the Anjanabonoina pegmatite. Both stones were obtained by Dudley Blauwet, although the smaller gem was purchased significantly earlier (June 2014) than the larger one (November 2017). Photo by Jeff Scovil.

Large Phenakite from Madagascar

Madagascar is known as a source of fine-quality crystals of colourless phenakite (e.g. Wilson, 1989). The main source is the Anjanabonoina pegmatite in central Madagascar, which occasionally produces large crystals, such as 'a rather flattened, doubly terminated, fully transparent gem crystal weighing 1.1 kg' that was mentioned by Weiss (1995). As Malagasy phenakite crystals tend to be well formed, most of them are sold to mineral collectors rather than as gem rough.

Recently, however, Dudley Blauwet (Dudley Blauwet Gems, Louisville, Colorado, USA) obtained a large faceted phenakite from Madagascar that weighed 203.41 ct (Figure 10). He obtained the stone in Sri Lanka in November 2017, and his supplier reported that the original rough weighed 500 ct and was purchased in Mananjary on Madagascar's east coast.

Although phenakite is known to occur in phlogopite schist at the Ambodivandrika emerald mine in the Mananjary area (www.mindat.org/loc-45813.html), the large size and high clarity of the stone obtained by Blauwet strongly suggest that it came from a pegmatite deposit. In addition to Anjanabonoina, there are at least three other phenakite occurrences in Madagascar that are potential sources of large, gem-quality material, according to Frédéric Gautier (Little Big Stone, Antananarivo, Madagascar). One of these localities (Fianarantsoa area) produced several hundred grams of transparent phenakite in 2017 and continues to produce rough material. Since these pieces typically do not show any crystal faces, it seems likely that they would be sold as gem rough.

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Recent Production of Poudretteite from Mogok, Myanmar

Poudretteite is an extremely rare borosilicate ($KNa_2B_3Si_{12}O_{30}$), and faceted examples are seldom encountered (cf. Smith et al., 2003; Mayerson, 2006). According to Dr Kyaw Thu (Macle Gem Trade Laboratory, Yangon, Myanmar), recently there were two new poudretteite discoveries in the Mogok area of Myanmar (e.g. Figure 11). First, an alluvial concentration of poudretteite was found by a miner looking for yellow danburite across the valley from Pein Pyit. Most of the rough material was colourless and had rough surfaces. Exactly when it was found and how much was produced is unclear. Then, in March 2018, a group of miners began working an area at Pyant Gyi (located in eastern Mogok, near Pein Pyit; Figure 12) and found both *in situ* and eroded poudretteite. This is the first time that a primary deposit of poudretteite has been found in Mogok.

Figure 11: This fine 2.6 g poudretteite crystal was mined from a newly discovered primary deposit in the Pyant Gyi area of Mogok. Photo by Thai Lanka Trading.

Figure 12: Local miners work the Pyant Gyi area of Mogok in search of poudretteite and other minerals. Photo by Kyaw Thu.

Pyant Gyi is a flat plain, and the *in situ* poudretteite was apparently found on the hill above it. The Pyant Gyi area was already a known source of alluvial poudretteite, and it also hosts primary and secondary deposits of spinel, ruby and sapphire, as well as rarer gems such as johachidolite and hackmanite (Themelis, 2008).

The recent mining has yielded a small quantity of poudretteite as broken pieces, well-formed crystals, and crude matrix specimens with smoky quartz. The best crystal known to author MHS is a 2.6 g bicoloured (colourless-pink) specimen that he purchased in May 2018 (again, see Figure 11). Most of the recently produced poudretteite is of low quality, being quite included with hollow tubes. The majority of the material is colourless with a pink 'skin' that is usually lost in faceting. The largest cut stone seen by author MHS weighed 9.59 ct but was heavily included and poorly cut. Some lightly included stones weighing more than 3 ct were obtained by this author, but after recutting to proper angles most of them weighed <2 ct. The faceted stones range from colourless to pink, or may display both colourless and pink areas (e.g. Figure 13). It is extremely rare to encounter a pure pink poudretteite that is nearly eye clean and >1 ct.

The total production of all grades of poudretteite from Pyant Gyi since March 2018 is estimated by Dr Kyaw Thu to be only about 100 g, so poudretteite remains a very rare gem material despite these recent discoveries.

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Figure 13: Recent poudretteite production from Pyant Gyi ranges from colourless (**a**: 1.06 carats total weight) to pink (**b**: 0.73 ct), and some stones may show colourless/pink zones (**c**: 2.48 ct). Photos by Thai Lanka Trading.

Yellow Scapolite from Tanzania Showing Peculiar Daylight Fluorescence

Yellow scapolite has been reported from two areas of Tanzania: the Umba area in the eastern part of the country (Zwaan, 1971) and in central Tanzania (Graziani and Gübelin, 1981). During the April 2016 Arusha Gem Fair in Tanzania, rough stone dealer Farooq Hashmi acquired a scapolite crystal that was reportedly found in Umba, and it was subsequently faceted by Peter Torraca (Torraca Gemcutting, Houghton, New York, USA). Due to the stone's unusual colour behaviour, it was loaned to author JCZ for further examination.

The cut-cornered rectangular modified brilliant (radiant cut) weighed 3.60 ct and measured approximately 10.93 × 7.13 × 6.83 mm. It was transparent, and when viewed in daylight-equivalent lighting it was slightly greenish yellow (Figure 20). In sunlight it appeared to turn to a purer, more vivid yellow, while peculiarly it looked slightly more orange in indirect sunlight (Figure 20, inset), particularly when tilted slightly.

RI readings gave 1.555–1.589, yielding a birefringence of 0.034, and the stone showed a uniaxial negative optic character. Hydrostatic measurements yielded an SG value of 2.73. The dichroscope revealed only weak dichroism, in slightly greenish yellow and yellow. The stone was free of inclusions except for one large, spiky, needle-like growth channel. This inclusion had a rhomb-shaped cross-section, and where it reached the surface it appeared to be filled with some secondary, fine-grained material. As shown in Figure 21, the stone luminesced a very strong yellow to long-wave (365 nm) and a moderate orangey yellow to short-wave (254 nm) UV radiation. In both cases, no phosphorescence was observed. A photoluminescence (PL) spectrum excited by a green (532 nm) laser showed a strong band centred at 620 nm in the orange-red region (Figure 22).

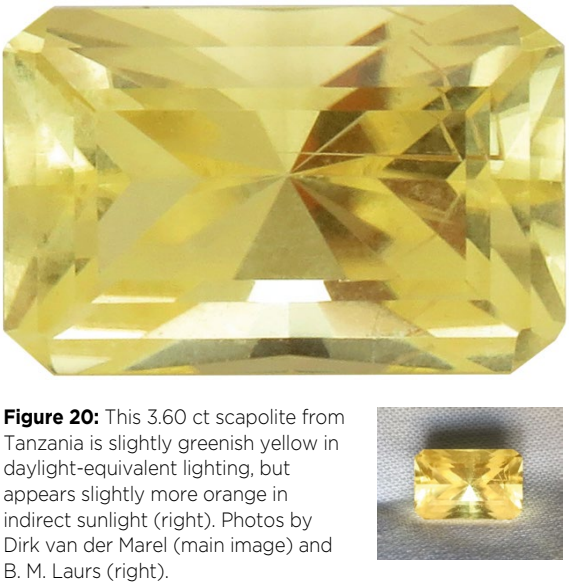
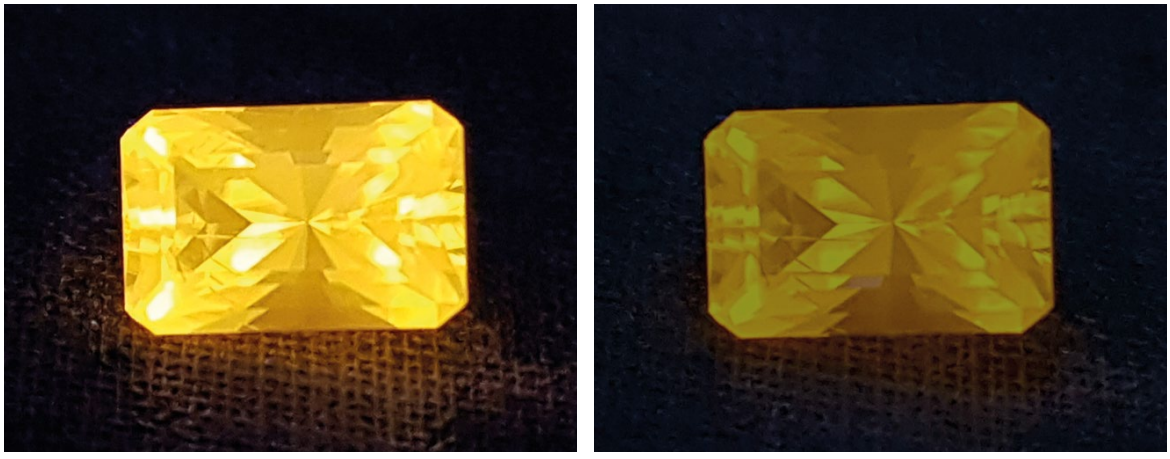


Figure 20: This 3.60 ct scapolite from Tanzania is slightly greenish yellow in daylight-equivalent lighting, but appears slightly more orange in indirect sunlight (right). Photos by Dirk van der Marel (main image) and B. M. Laurs (right).

The RI and SG values, and especially the high birefringence, of this scapolite correspond to a meionite composition, which has RIs of 1.556–1.600, birefringence values of 0.024–0.037 and an SG of ~2.78 (Deer et al., 2004). Meionite ($Ca_4Al_6Si_6O_{24}CO_3$) is isomorphous with marialite ($Na_4Al_3Si_9O_{24}Cl$) in a series that constitutes 'scapolite'. There is an approximate linear variation between mean RI and scapolite composition (expressed as %Me or mol.% meionite), as well as between birefringence and %Me (Deer et al., 2004). Using the mean RI

Figure 21: The 3.60 ct scapolite fluoresces a very strong yellow under long-wave UV (left) and a moderate orangey yellow under short-wave UV radiation (right). Photos by J. C. Zwaan.



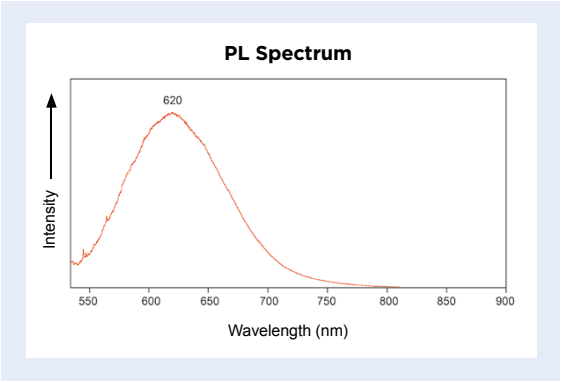


Figure 22: The yellow Tanzanian scapolite produced strong photoluminescence at 620 nm (orange-red region) when excited with a green (532 nm) laser. The small peaks on the left are Raman features.

$(\varepsilon+\omega)/2 = 1.572$ in the expression $(\varepsilon+\omega)/2 = 1.5346 + 0.000507$ %Me, the present scapolite is estimated to consist of 74 mol.% meionite. However, based on its high birefringence of 0.034, a composition of ~85 mol.% meionite would be expected. Thus, the stone's composition is inferred to be somewhere in the 74–85 mol.% meionite range.

Raman spectra most closely matched the spectra of meionite in the RRUFF database. Semi-quantitative EDXRF chemical analyses confirmed the dominance of Ca over Na, in accordance with a meionite composition, and also showed traces of sulphur (0.6 wt.% SO_3) and iron (0.03–0.04 wt.% FeO). In the mid-infrared spectrum, the presence of a sharp feature at ~2560 cm^{-1} confirmed the presence of HCO_3^- (an associated part of the scapolite crystal structure; Swayze and Clark, 1990) in the anion site.

Strong yellow fluorescence in scapolite is attributed to the presence of S_2^- in the anion site (Burgner et al., 1978), but as suggested by the PL spectrum (again, see Figure 22), the emission spectrum appears to be dependent on excitation wavelength. Burgner et al. (1978) also showed that the luminescence emission spectrum displays a series of distinct bands covering the region from 500 to 700 nm, which according to them indicates that S_2^- occupies a number of different sites. At room temperature and under long-wave UV excitation, Kirk (1955) recorded the PL spectrum of scapolite with a most intense peak at 570 nm. However, the strongest emission peak in scapolite recorded by Sidike et al. (2008) was 596 nm (slightly yellowish orange) using 390 nm (violet) excitation. The latter study also showed that the excitation efficiency is lower at 365 nm than in the violet range. For the present scapolite, the orangey yellow fluorescence that was evidently excited by the violet component of daylight was strong enough to be seen in indirect sunlight.

During the February 2018 Tucson gem shows, one of the authors (BML) was shown another yellow scapolite from Tanzania with very similar colour and fluorescence behaviour (Figure 23). This 11.52 ct scapolite in the collection of Herb and Monika Obodda (Warwick, Rhode Island, USA) had been recut by gem dealer Mark Smith from a stone that he obtained in Sri Lanka in late 2017. Herb Obodda reported that he first encountered such scapolite in the late 1970s as two stones in a parcel of rough yellow grossular from the Leletema Hills of north-eastern Tanzania. They were identified as meionite by Dr Pete Dunn at the Smithsonian Institution (Washington DC, USA). Their yellow fluorescence made them easy to separate from the garnet parcel.

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Figure 23: Weighing 11.52 ct, this scapolite from Tanzania has similar colour and long-wave UV fluorescence as the stone documented in this report. Photo by Thai Lanka Trading.