MOGOK:
Mining Beauties and Beyond

By Dr. Thomas Hainschwang and Franck Notari

Until recently, the Mogok Stone Tract was nearly impossible for foreigners to access. While visits by gemologists to the Mogok region in Myanmar have become more frequent in recent years due to an easing of receiving travel permits for this restricted region, a two-week trip by a group of renowned lab gem researchers and gemologists, under the auspices of Kennedy Ho of AIGS Bangkok and his staff, was an extraordinary experience. With Prof. Dr. Emmanuel Fritsch from the IMN in Nantes (France), Franck Notari and Candice Caplan of GGTL Laboratories in Geneva (Switzerland), and Dr. Thomas Hainschwang of GGTL Laboratories in Balzers (Liechtenstein) on board, the team visited the various mines, markets and temples.

The Mogok Stone Tract

With the first references to rubies from Mogok dating back to the 6th century, this region, which consists of several valleys and two main cities – Mogok and Kyatpyn – is without doubt the most famous location for fine gemstones, particularly ruby and sapphire. The region is, in fact, peppered with gemstone mines; even in the city there are mines all over the place. In addition to the many mines, the Mogok region is characterized

Top: Fig 1: A panoramic view of the city of Mogok. (Photo: T. Hainschwang)

Bottom: Fig 2: When arriving in Mogok, one is immediately reminded what the region is famous for - rubies. (Photo: C. Caplan)

Top: Fig 3: The Daw Nan Kyi monastery. (Photo: T. Hainschwang)
Bottom: Fig 4: A spectacular karst formation outside the city of Mogok. (Photo: T. Hainschwang)

by Buddhist temples and monuments, stupas are even more abundant than gem mines.

The city of Mogok is located at an altitude of 1,170 m above sea level, and hence has a colder climate than Mandalay which is close to sea level. In reality, this means that in the summer season it is fairly hot during the day and comfortable at night, but in winter it can be cold, especially at night when the temperature can drop to 5°C. The climate is also characterized by very distinct dry and rainy seasons, with little or no rain from November to April and lots of rain from May to October; an average of 442 mm of rain falls in August. These distinct dry and rainy seasons mean that most mines – unless they have a water reservoir available – will be mined in the dry season and only wash the material during the rainy season. Since most vertical shaft mines cannot afford the drainage systems necessary to pump out rain water, these mines are closed as soon as the rainy season starts. The time the mine is shut down is used for the processing of the materials mined during the months of the dry season.

The vast majority of gem mining is related to the abundant marble that dominates the geology of the Mogok region. Spectacular karstic formations, as shown in Fig. 4 are the result of the dissolution and erosion of the marble by the action of water, wind and temperature. The karstic rocks are black as a result of manganese oxides on the surface.

From Artisanal to Mechanized Mining and Illegal Backyard Mines

In Mogok, both primary and secondary mining is carried out. Most mines are narrow vertical shafts known as four-feet mines, that are typically 20m to 40m deep. Typically, these mine shafts are dug into the overburden until a karst or other rock type is reached, where the ancient river bed has deposited heavy minerals (secondary deposit), or where the gems can be directly found in the rock (primary deposit). Nearly all artisanal mining is carried out in secondary deposits since primary deposit mining is much more cost-intensive. The four-feet shafts are typically secured and stabilized by bamboo and wood, and the walls plastered with fern or other leaves.

The bamboo and wood used is all there is to hold on to when climbing down into such a shaft. With very few exceptions, there are no safety measures whatsoever to protect a miner from falling down the vertical shaft if he loses his footing during the adventurous climb into the mine. Hence, caution is very important in these mines and every step must be well planned in order to avoid serious injury or death. Larger mine shafts do exist, particularly for primary mines of depths of up to 300m. It is noteworthy that even for these large and deep mines, no means of transport down the mine exist in Mogok. These depths are reached by the miners climbing down the tunnels and shafts and their very physical journey down the deepest mines takes 30 minutes to an hour. Here we describe just a few of the most noticeable mining excursions we carried out in this fantastic journey.

Top: Fig. 5: Left: Jean-Baptiste looking down the square pit shaft at the Yebu-Thabapin-Kyar mine site. Right: A miner holding a light bulb in the mine, which was extremely limited in space. (Photos: T. Hainschwang)

Bottom: Fig. 6: Candice and Franck at the processing plant of the Baw-Lon-Gy East mine. (Photo: T. Hainschwang.)

Yebu-Thabapin-Kyar

On the first day, we visited this long-known mining area situated within the town of Mogok. It is characterized by many artisanal mining ventures, accessing the gem-enriched soil via challenging shafts. Normally visitors are not allowed to visit the mines because of the potential danger involved. Visitors need strong nerves when climbing down such an artisanal mine, since the shafts are dangerous and the space between the cleaned-out karstic underground rocks extremely limited; claustrophobia is about the last thing that one needs in such a mine (Fig. 5).

Emmanuel, Franck, Kennedy and Thomas dared to climb down the mine which has a total depth of 25 to 30 meters, and which has very little space to move between the wooden shoring and the karstic rocks. The mine produces a variety of gemstones from alluvial soil that is removed from the pockets surrounding the karstic marble; this is mostly ruby, sapphire and spinel. This mine does not have access to a lake in order to wash the soil, hence the mine is worked all through the dry season, and the collected soil is washed only as soon as the rainy season starts. During the rainy season, the mine must be closed since the rainwater floods the tunnels.

Baw-Lon-Gyi East

After the first artisanal mine, we traveled to a far more mechanized operation, the Baw-Lon-Gyi East mine. This

Top: Fig. 7: A view of the enormous plateau formed by the marble from the ruby mining at the Baw-Lon-Gy East mine. (Photo: T. Hainschwang)

Bottom: Fig. 8: Left: a group of Burmese women washing the gravels from a rivulet on the mining site. Right: miners working a small open pit mine for alluvial gems. (Photos: T. Hainschwang)

primary deposit produces mainly ruby and is a very large commercial operation. A four stage crushing/washing plant is operated, in which the first three stages are used by the mining company, while the last stage is for local people (Fig. 6). The material from the fourth stage is brought by the local villagers by truck – apparently typically rented for $1 per transport – to a huge calcite plateau that has formed from all the mined marble and because of which the village had to be moved in order not to be buried under the enormous quantity of white gravel. On this marble plateau there is usually a very active market of local people selling the small rubies they recover from the piles of marble fragments they collect from the washing plant. On our arrival there was very little business going on as local people were attending a Buddhist religious ceremony.

Kyauk-Pyat That-A-Thay Byant / Yadanar-Kaday-Kadar ('Mine of millions and millions of precious stones')

The next day we visited this mine which used to belong to the Myanmar government and that used to produce significant quantities and qualities of sapphires, rubies and spinels. Today, it is split between many small mining groups. Most operations are now working the soil and not the hard rock; the last venture in a primary rock was unsuccessful. Here, women washing the soil of small rivers work side-by-side with groups that pump

Fig. 9: The stones found in the rivulet by the women were offered for sale to us; they consisted mostly of small spinel crystals and sapphires, generally of low quality. (Photos: T. Hainschwang)

Fig. 10: Left: The access to the Dattaw mine was a path covered by calcite rhombohedra. Right: Descending the Dattaw mine was an adventure, needing to hold on to one rope at the shallower slope and two ropes for the steeper slope. (Photos: T. Hainschwang)

water into karstic rock formations to flush out all the soil and the heavy minerals concentrated within (Fig. 8).

The finds in this mine were not very significant at the time of our visit, and the most successful miners seemed to be the women washing in the little river. They had plenty of mostly very small stones, generally of poor quality, of spinel, ruby, and sapphire, amongst others, and offered them for sale on their traditional golden plates (Fig. 9).

Dattaw

The next day we visited the very large state-owned peridot mine in Pyaung-Gaung, from which we continued to the Dattaw ruby mine. This primary mine is especially interesting for the consistency of the host rock: the marble is extremely coarse with

Fig. 11: Left: At the bottom of the Dattaw mine showing (left to right): Jean Baptiste, Emmanuel, Thomas and Candice. Right: A Burmese miner extracting some rubies from the marble. (Photos: F. Notari)

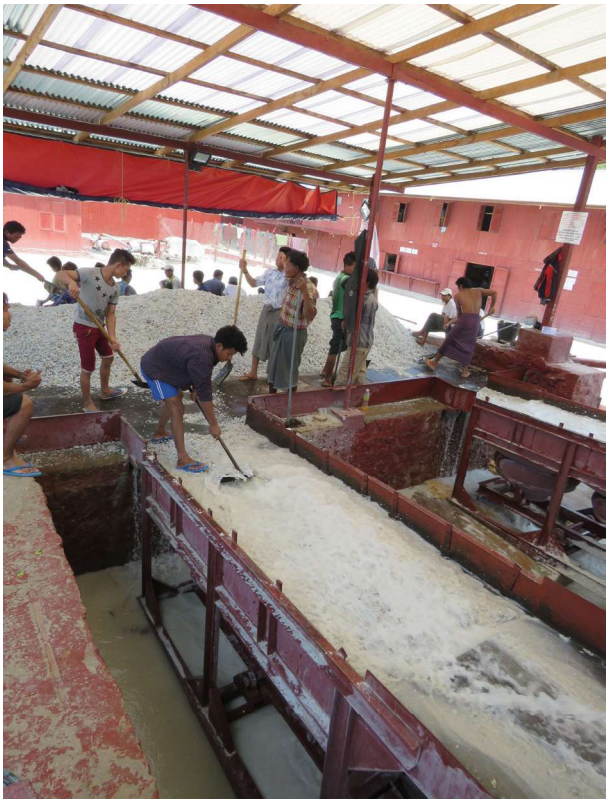
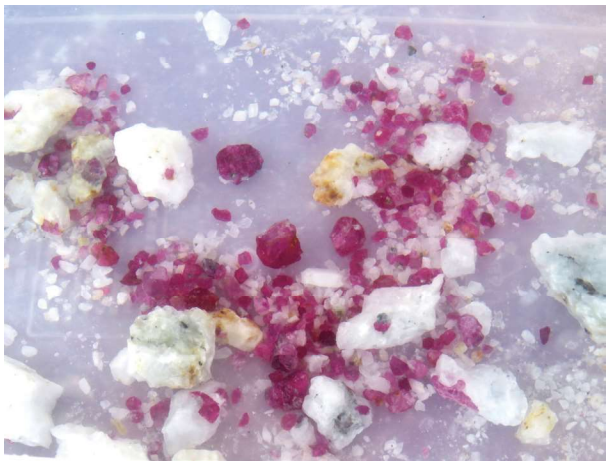


Fig. 12: The large crushing and washing plant at the Kyauk-Saung mine. (Photos: T. Hainschwang)

very large individual calcite crystals. In fact, when approaching the mining area, there are calcite rhombohedra everywhere, and you basically walk on a path made of such calcite crystals. The calcite crystals range from white to yellow to gray and nearly blue. According to the miners, the best color of the marble in order to find rubies is gray to blue.

The Dattaw mine is a comparatively large tunnel going down the hard rock, first at about a 30° slope, increasing to about 70° in the lower part. One descends the mine, which is approximately 100 meters deep, by holding on to one or two ropes. On this occasion, Candice, Emmanuel, Franck, Jean-Baptiste and Thomas climbed down into this interesting ruby deposit (Fig. 10). The mine is being worked using explosives, and whenever there is a productive zone the rock is worked



Top: Fig. 13: The Kyauk-Saung mine is the only mine where there were some rather large, good-quality rubies. (Photos: T. Hainschwang)
Bottom: Fig. 14: Left: The descent down the Oh-Bin West via a wooden ladder. (Photo: T. Hainschwang). Left to right: Thomas, Kennedy and Mr. Ye Minn Htoon - one of the mine owners - on the intermediate platform of the Oh-Bin West ruby mine. (Photo: E. Fritsch)

manually using hammers and chisels (Fig. 11).

We did not see much production at this mine, with the output on the day of our visit being very small: a dozen small ruby crystals mostly still attached to calcite rhombohedra.

Kyauk-Saung and Kyi-Taung

The most important mines we visited the next day were the ones operated by the Yannada Shin Gemstones Co., which include the Kyauk-Saung and the Kyi-Taung ruby mines. These mines are among the biggest ruby mines in Mogok, even though the Kyi-Taung mine, with its 100 employees, is only at the beginning of its production, having been started at the beginning of 2016 and still being under development. In four months working the mine, it has achieved a depth of 180 meters but is still not productive and only dead rock is brought up to the surface.

The Kyauk-Saung mine is fully developed and productive with more than 500 employees who live on the site for six months a year. It operates a very large washing plant (Fig. 12) and the production we saw on-site seemed not to be large. However, a few rubies of respectable size and good quality were in the container where all the recovered rubies were kept (Fig. 13). The Kyauk-Saung mine is accessed through several narrow vertical tunnels via ladders, and is up to 300 meters deep. Accessing its deepest point takes about an hour for the less experienced miners, the most experienced ones take half an hour. The miners work for 12 hour shifts and remain in the mine when explosives are used.

Ohn-Bin West

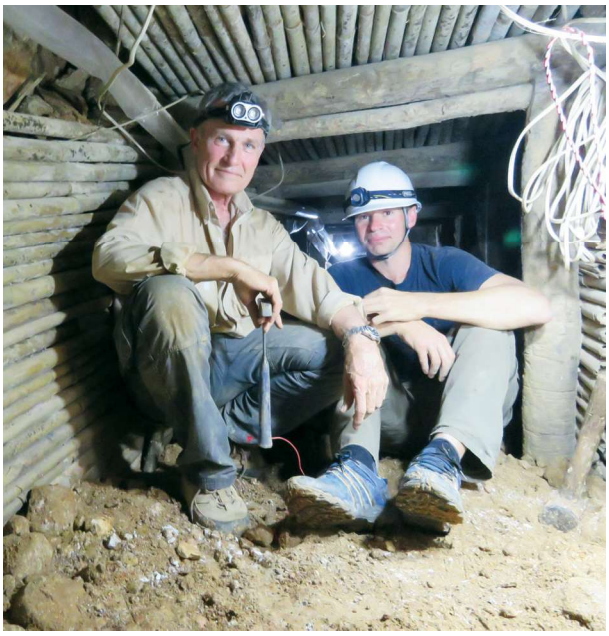
On May 10, we drove towards the region of the Baw-Mar mines, where – after a visit to their offices and cutting facility

– we then visited the Oh-Bin West ruby and spinel mine, a primary mine with a major 100 meter long horizontal tunnel leading to a sharply inclined shaft accessible via a 50° to 85° steep wooden ladder which was rather slippery after a rainy day. Currently, the mine has a depth of about 60 meters, with a progression of about three meters per month, and it is planned to go down to a depth of 200 meters. The mine's production does not cover the cost of mining – the largest good gem-quality ruby produced in recent years was facetted to a 2-carat gem. The mine is only kept going through the profits made at the Baw Mar mine. All this effort is being invested in the hope that large good-quality rubies will be recovered from the mine at some point. One of the owners of the mines along with Emmanuel, Franck, Jean-Baptiste, Kennedy and Thomas descended to the depths of this operation (Fig. 14).

Baw-Mar

From the Oh-Bin West ruby and spinel mine, we drove to the nearby Baw-Mar sapphire mines which consist of 13 vertical "4 feet" shafts (Fig. 15, right), from which on our visit only one was producing a large number of sapphires (Fig. 15, left). In addition to the 13 shafts, the mining operation also includes a very large open pit mine, that currently only sporadically produces sapphires.

Fig. 15: Bottom: The Baw-Mar mine site with the setups for the various vertical four-feet mine shafts. Top: A look down the four-feet shaft that was accessed during the visit. (Photos: T. Hainschwang)



Bottom: Fig.16: Left: Thomas climbing out of the square pit shaft at Baw-Mar. (Photo F. Notari) Right: Franck and Thomas in the horizontal shafts of the Baw-Mar mine.

The Baw Mar deposit produces blue and some fancy color sapphires that visually resemble magmatic sapphires more than metamorphic ones. Many of them are rather dark, but part of the production has beautiful color. The mine has produced a lot of material since 1993, so it is very surprising that the gemological community only recently started showing an interest in this deposit and the sapphires that it produces. Looking at the gemological properties of the sapphires that are rather different to the properties of all other sapphires from Mogok, one must wonder what type of "origin" was issued on lab reports for such stones submitted for origin determination. With the exception of Baw-Mar, we did not see a single really productive primary sapphire mine, only secondary mines that supposedly produce some sapphire besides other materials. According to the owner of these mines, the running cost alone of the Baw-Mar mine is around $100,000 per month, hence an important production of high-quality gems out of such a mine is critical for its commercial survival.

Franck and Thomas went down the most productive pit, which is a vertical "4 feet" mine with a depth of about 20 meters (Fig. 16, left). This mine is the only one we visited that actually had a security bar where you could attach yourself via a belt in order to be slowed down and finally stopped in case of slipping and falling during the somewhat risky descent (Fig 15, right). As can be quite obviously seen in Fig. 16 on the right are the horizontal shafts where the miners find the sapphires: they were basically also 4 feet by 4 feet, hence 1.3 m x 1.3 m in size, and so did not provide very comfortable conditions in which an adult could work.

The production of the Baw-Mar mine was shown to us in the company offices that are situated near the mine, with many hundreds of carats of rough and polished stones shown to us by one of the owners and the commercial manager (Fig. 17, left). Most cut stones that we saw were in the 0.3 to 3.0 ct range, in colors from medium blue to dark blue. We were shown a few cut sapphires of quite impressive sizes, such as a 51-carat yellow sapphire and the 33-carat blue sapphire cabochon shown in Fig. 17 on the right.

At the end of this day of the expedition, we saw the most important and productive blue sapphire mine in Mogok in recent years, and one which is likely to remain so for years to come.

Pain Pyit

Our last day of mine visits covered the really artisanal and mostly illegal mining that's being conducted in many backyards in villages around Mogok. In the Christian village of Pain Pyit, plenty of such vertical shaft mines can be found in the backyard of many houses in the village (Fig. 18, left).

There was a simple washing plant set up at the local lake, where the water was pumped up in order to wash the soil recovered from several backyard mines (Fig. 18, right).

Fig. 18: Left: An privately operated backyard mine mine in the village of Pain Pyit. Right: The washing plant using the water from a local lake. (Photos: T. Hainschwang)

Fig. 17: Left: Checking large parcels of sapphires at the offices of the Baw-Mar mine. Right: A 33-ct blue sapphire recovered from the Baw-Mar mine. (Photos: T. Hainschwang)

Top: Fig. 19: The extremely modest finds after washing 120 large bags of soil from "backyard mines". (Photo: T. Hainschwang)

Fig. 20: Bottom: Franck Notari with the Burmese driver and guide Jordan looking at stones at the Cinema Market. Top: Burmese money and the yield of several visits of the Mogok gem markets. (Photos: T. Hainschwang)

When we visited this site, 120 large bags of soil mined that represent several weeks of work were washed to recover gemstones. We stayed until the washing process was over and hence we saw the miserable yield: large chunks of black tourmaline, colourless topaz, a few non-gem sapphires and a couple of spinels was all that was recovered in this huge effort (Fig. 19). Commercially, the material recovered was virtually worthless. This is one of the clearest examples of how difficult it is to make a living as a gem miner.

Markets, Temples and Other Interesting Sites

During our stay in Mogok, we visited the local gem markets and gem dealers on several occasions in order to acquire reference materials and samples in addition to the ones acquired at the mines. These include the Cinema Market (Fig. 20, left), the West Market and the Umbrella Market. These places are extremely interesting for acquiring samples of all gems and minerals found around Mogok. In these places, one realizes that Mogok is much more than only corundum and spinel – the variety of different minerals including various

Top. Fig. 22: The Kyauk-Pyat-That monastery built on an impressive karstic rock. (Photo: T. Hainschwang)

Bottom. Fig. 21: Memorial stones from the late 19th century, just after the final Anglo-Burmese War, at the British military cemetery in Ywar Thar Yar near Mogok. (Photo: T. Hainschwang)

gem species is astonishing (Fig. 20, right).

It is very important in these markets that buyers really must know the prices paid locally in order not to overpay for the goods. The inexperienced buyer is quickly driven into heavily overpaying due to the rush one gets by being flooded with an impressive quantity of rough and cut gemstones from sellers who quickly surround a potential buyer.

Remnants from the three Anglo-Burmese wars (1824–26, 1852 and 1885) that resulted in Burma becoming a British colony can be found in the Mogok region. We visited old war bunkers, and the run-down British military cemetery in Ywar Thar Yar that dates back to the late 19th century (Fig. 21).

With its strong Buddhist religion strongly dominating the entire Mogok region, the landscapes are filled with stupas, temples and monasteries. One of the most impressive buildings in Mogok is the Kyauk-Pyat-That monastery that has been built on a huge karstic rock (Fig. 22). This region is also where the painite discovery was made in 2005.

The strong Buddhist traditions were also shown to us on one of the last days in Mogok: by coincidence we found ourselves in a big procession with dozens of little boys in fancy Buddhist dresses being carried along the road, with music and a long row of cars, a real party for everybody. This was a Buddhist Shinbyu ceremony, a rite of passage ceremony for boys under 20 (Fig. 23).

Concluding Remarks

The trip to the Mogok area was an amazing mixture of mines of all sorts, landscapes, temples and gem markets. After having seen the different mines, having climbed down the most adventurous mining shafts, and having experienced the difficulties involved in recovering these gemstones, we have once more had our eyes opened to understanding why some of these gemstones are so valuable. Rubies from Mogok in large sizes and good qualities are simply exceedingly rare. Since Mogok will open up and lift travel restrictions in the future and will likely change very drastically, this remains a very authentic country with all its beautiful sites and amazing mines. Hence this visit by our group will remain a beautiful memory of Mogok with all its myths. ♦

Fig. 23: A Buddhist Shinbyu ceremony that we witnessed by coincidence during our Mogok trip. (Photo: T. Hainschwang)

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