A. Schauss specimen. J. Scovil photo.


# MINERALS

Issue #6 The Collector's Newspaper 2013


## In this issue also:



Spirifer Minerals specimen. J. Scovil photo.



# Lucky Monday in Colorado, USA

Joseph L. DORRIS

*Author with the freshly extracted first important specimen from the pocket known as "Two Pillars". T. Dorris photo.*

INTRODUCTION

The Pikes Peak region has been producing amazonite and smoky quartz specimens as well as other pegmatite minerals since the late 1870s. After a few earlier experimental digs, the early 1990s saw a couple of collectors beginning to use mechanized equipment to dig below the old dug-out areas. Joe Dorris first used a backhoe in 1993, digging downwards to 4 m. He had some limited success finding some remaining, undiscovered miarolitic cavities (pockets) in the decomposed Pikes Peak granite.

Beginning in 2000, Joe discovered an extensive pegmatite swarm that held an unusually high number of pockets. He brought out larger machinery, capable of crushing through the decomposed granite to depths of 15 m to where some of the pockets were located. Many of the pockets contained finely colored euhedral amazonite crystals in association with deep black smoky quartz. This discovery became known as the Smoky Hawk structure and has since produced many of the world's finest specimens.

The 2011 mining season tested Joe Dorris' mining company with broken equipment and runaway costs. Both excavators broke down, more than dou-

*Continued on next page*

J. Scovil photo.

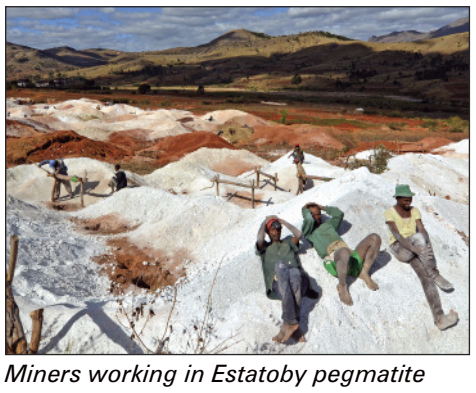
*Classic combination of smoky quartz with amazonite from Lucky Monday pocket, Smoky Hawk claim, Colorado, USA. 8.2 cm in length. Spirifer collection.*

# Giant liddicoatites from Madagascar

Federico PEZZOTTA & Tomasz PRASZKIER

INTRODUCTION

Sahatany Valley is one of the most famous and important pegmatite fields and sources of gemstones and specimens, especially for tourmalines, in Madagascar and the whole of Africa for that matter. Important diggings for multicolored and red tourmaline gemstones and specimens have been documented since the beginning of the 20th century. Decades of mining, which removed most of the easily accessible parts of the pegmatites, have left modern day miners only the more difficult to reach deposits. Hence, the discovery of extraordinary pockets is now a rarity.



*Miners working in Estatoby pegmatite in Sahatany Valley, Madagascar, resting after work. J. Gajowniczek photo.*

This is one of the reasons that an exceptional find of a huge pocket containing well formed, multi-color, and gemmy liddicoatite crystals in mid 2012 was so surprising and caused tourmaline fever in the area. Crystals from that find are without doubt some of the best known from Madagascar and also some of the best known liddiocatites in the world.

*Continued on page 13*

*Huge, multicolor liddicoatite crystal from Estatoby, Madagascar; 14 cm in length. Watzl Minerals specimen. A. Watzl Sr. photo.*

*Continued from page 1*

bling their season's expenses. But as luck would have it, they discovered what may end up being the best amazonite with smoky quartz pocket ever found in Colorado – the Lucky Monday pocket.

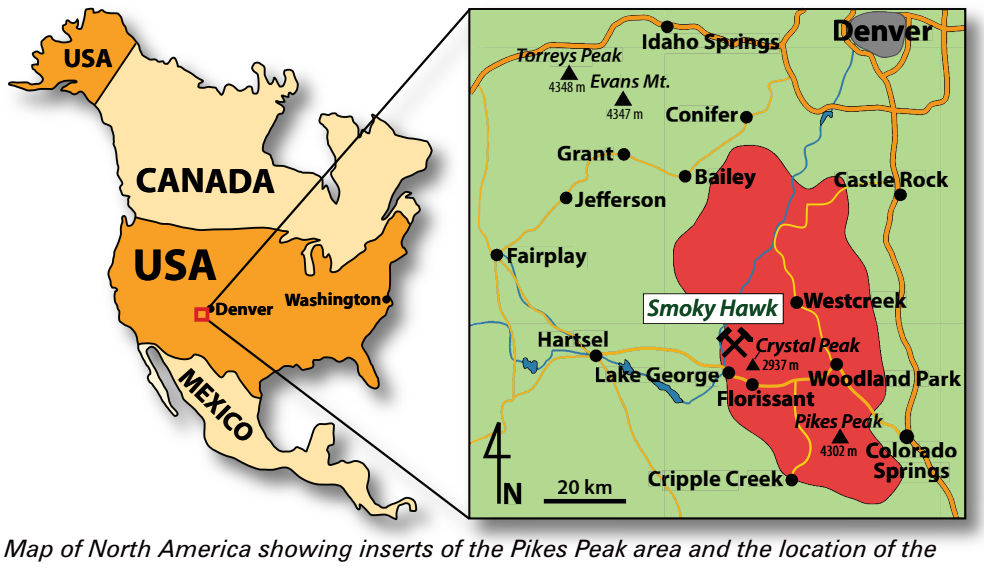
LOCALITY AND GEOLOGY

The Smoky Hawk claim is located in the Pike National Forest, 32 km northwest of Pikes Peak, Colorado at an elevation of 2,725 m on a ridge above Crystal Creek. Due to winter snow and ice, access is limited to about seven months a year. Mechanized operations are significantly more limited due to ground conditions and frequent electrical storms that bring wind, heavy downpours, hail, and snow. Site access is through forest roads and a steep, four-wheel drive road.

The Crystal Peak district is located within the Pikes Peak batholith (~1.07 Ga, Mesoproterozoic era), which was formed in a lengthy multistage process of several magma intrusions. Today the Pikes Peak batholith consists of three main intrusive centers – Pikes Peak, Lost Park, and Buffalo Park. Most of the Crystal Peak district is located within a slightly younger pluton known as the Lake George ring complex on the northwest edge of the Pikes Peak intrusive center. This younger intrusion created tensional fracturing acting as a conduit for later-stage magma that formed pegmatite dikes. It is within these dikes that the miarolitic cavities occur. Today the rocks that built the Lake George ring complex are more resistant to weathering and form higher relief compared with surrounding areas.

Although pegmatites intruded throughout the 3,100 km² Pikes Peak batholith, relatively few contain miarolitic cavities, and the majority that do, occur within the Crystal Peak district. These pegmatites are classified within the NYF (Niobium-Yttrium-Fluorine) family of pegmatites. Their class and subclass are miarolitic, rare-earth element (MI-REE). The rare earth occurrences help give rise to some of the more unusual minerals found such as, bastnäsite-(Ce), xenotime, phenakite, cassiterite, monazite, rutile, and columbite-(Fe).

*View of the Smoky Hawk claim. J. Dorris photo.*




*Map of North America showing inserts of the Pikes Peak area and the location of the Smoky Hawk claim.*

Although over 60 mineral species have been found, those most common are microcline, quartz, albite, biotite, zinnwaldite, fluorite, hematite and goethite. Those most sought after by collectors are amazonite (the blue-green variety of microcline) with smoky quartz, and their associations with cleavelandite (the platy variety of albite), fluorite, and goethite.

*Workings at the Smoky Hawk claim. Ch. Borland photo.*

*Mining at Smoky Hawk claim. P5M photo.*

*Two excavators used for mining at Smoky Hawk claim. Ch. Borland photo.*

*Drilling and blasting hard parts of the granite is sometimes necessery. P5M photo.*

good amazonite pockets were found in a substantial pegmatite structure. Continued exploration uncovered a system of closely related pegmatites and between 2005 and 2010 a number of productive pockets were found and collected. In 2011, the pegmatite which eventually produced the Lucky Monday pocket was discovered.

The miarolitic cavities discovered at the Smoky Hawk are deceptively extensive, lens-like formations up to 90 by 60 m. The pegmatites occur *en echelon* , some within a meter of each other, and form a swarm of closely spaced and related pegmatites. Others are isolated. They spread linearly from adjacent

SMOKY HAWK CLAIM
PEGMATITES AND COLLECTING

In December of 1998, after 16 years of prospecting, the Smoky Hawk claim was located. It is a standard 20 acre (approximately 8 hectare) unpatented mining claim in the Pike National Forest. The area was previously heavily hand dug by field collectors, but it stood to reason by using heavy equipment, deeper pockets might be found. Initial mechanized prospecting began in 2000 and three

aplite or pegmatite dikes that developed along more vertically oriented fractures in the batholith.

Typically, the pegmatite vein is relatively thin, ranging from 2 to 5 cm with a producing pocket zone thickening to 30 cm, rarely a meter. These thicker zones tend to surround a miarolitic cavity. Pocket formation is largely structurally controlled in that the magma and accompanying volatiles collect in areas of directional change (such as the lowermost curvature of a pegmatite vein or

*Lucky Monday pocket shows up for the first time, Tim is measuring it and showing how deep it is. Quality of the crystals is still unknown at that stage of work. J. Dorris photos.*

along a fault line) where they subsequently crystallize and form cavities that allow for the development of pegmatitic minerals. Comparatively, the linear pegmatites rarely give rise to pockets.

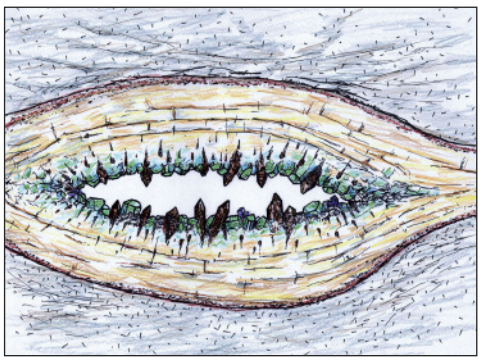
The cross section of a typical pocket starts from the country granite and grades into an aplite contact region. The aplite then grades into larger grained graphic granite. Next, the various pegmatite minerals, chiefly feldspar and quartz elongate toward the pocket opening and terminate in euhedral crystals within the pocket.

Typical miarolitic cavities found at the Smoky Hawk are approximately the size of a watermelon with a large cavity reaching 60 by 60 by 30 cm high. The cavities are generally ovoid and extend along the pegmatite, the floor being somewhat flatter than the ceiling. Rarely, miarolitic cavities occur in the more vertical pegmatite dikes.

Of the pegmatites encountered at the Smoky Hawk, three are the main producing bodies. Each has produced well over one hundred miarolitic cavities, approximately 90% of which have contained some amazonite and smoky quartz of varying quality. In comparison, other pegmatites within the Pikes Peak Batholith average two to three cavities, with only 10% containing smoky quartz and amazonite of generally lighter color.

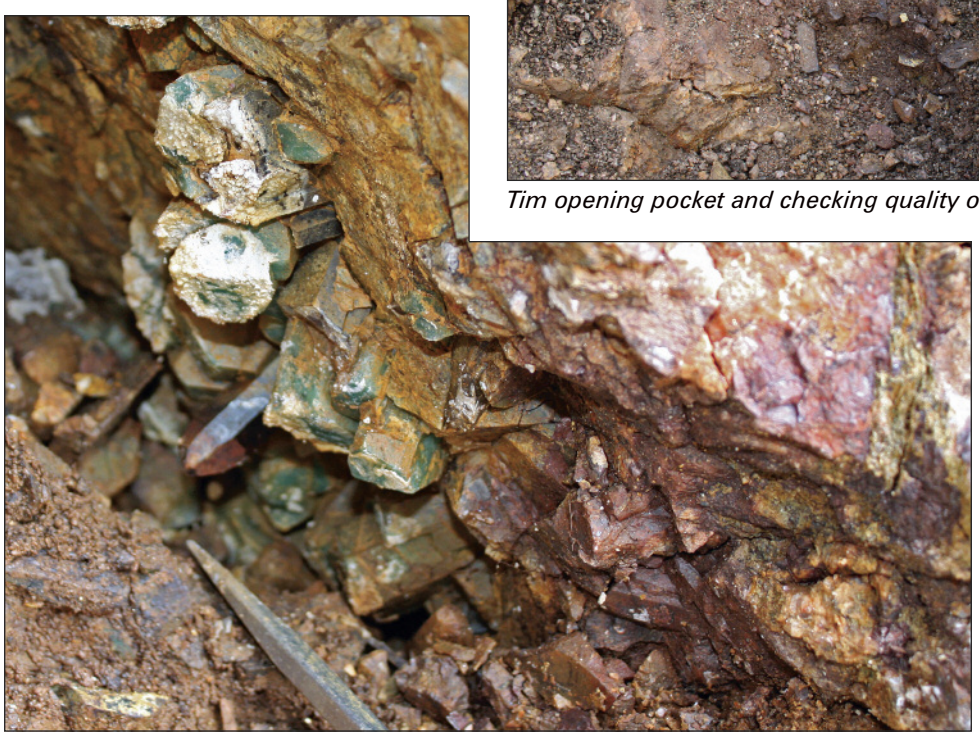
When encountered, most cavities show very little open space, almost never have crystals attached to the ceiling, and usually resemble a jumble of clay-covered broken aplite and pegmatite. Essentially, all the pockets forcefully rupture shortly after primary crystallization and continue to collapse due to weakened and deteriorating surrounding rock. Thus, when a pocket is opened, the first indications of its presence will be increasingly larger pegmatite fragments until a rusty red or yellowish euhedral face of a promising crystal is encountered.

Overburden is usually removed by mechanized equipment but collecting within pockets is typically done with hand tools. The upper broken layers (breakdown) are systematically removed until the pieces of pegmatite, with attached crystals still pointing into the pocket (ceiling plates), are revealed. These plates are then carefully pulled up, out, turned over, and hopefully reveal some incredible combination specimens. Where possible, each section of the pocket is systematically collected, left side, center, right side, and so on. The right side ceiling crystals are wrapped together and the right side bottom crystals are wrapped together and then placed together in the same box. This helps keep sections in the proper proximity of each so that broken specimens can be more easily reassembled.



*Idealized drawing of the pocket before it was collapsed and view of how it looked like when it was opened. J. Dorris drawing and photo.*

*Tim opening pocket and checking quality of the specimens. J. Dorris photo.*



*Crystals show up on the ceiling of the pocket. J. Dorris photo.*

All but a very few, probably less than 0.5%, combination specimens of smoky quartz with amazonite are not repaired. Contacts between the crystals are usually weak and the crystals easily separate along the contact planes. Add to this the double cleavage of feldspar and a high incidence of separated and cleaved crystals results. Therefore, the crystals are often reattached to one another, much like the pieces of a jigsaw puzzle. Unlike the typical context of "repair" where a broken crystal has been reassembled, most of the "repairs" on the finer amazonite and smoky quartz specimens are simple "fit repairs".

The most demanding process begins shortly after the pockets are collected. The boxed specimens are removed from the field and taken to a lab where the thousands of pieces are carefully washed. The pieces are then laid out in the order they were taken from the pocket, where possible in rows, left side top and below it, left side bottom, and so on. Following this – depending on pocket size – several months are invested in finding the missing fits and temporarily "repairing" the larger pieces.

*Amazonite and smoky quartz* in situ. *J. Dorris photo.*

After "fitting," the best pieces are selected for the lengthy cleaning process. Both chemical and mechanical means have been developed to remove the clay and Fe-Mn oxide overgrowths and staining that coat the crystals. At this point, it is often discovered that the Fe-Mn oxides have penetrated the amazonite crystals. About half the pockets contain specimens that can never be satisfactorily cleaned and thus, are never brought to market. Fortunately, some of the clay overgrowths and Fe-Mn staining is on the surface and can be removed, allowing the natural colors of amazonite and smoky quartz to be revealed.

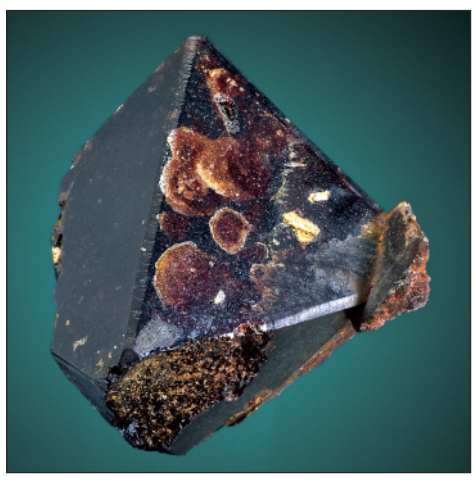
*Tim holding freshly collected first specimen containing smoky quartz and amazonite from the Lucky Monday pocket. Last photo shows the specimen after first washing. Now it resides in J. Voelter collection. J. Dorris photos.*

*Abraham Velasco recovers first genthelvite in the Crystal Peak area found in side pocket of the Lucky Monday. P5M photo.*

The final steps include reassembling the matched pieces and permanently repairing the pieces into fine specimens.

LUCKY MONDAY POCKET

A large pocket discovered on 13 June 2011 was dubbed the Lucky Monday pocket because it was the silver lining to an otherwise, near-disastrous season. It has proved to be one of the most exceptional pockets discovered in the 140 years of collecting in the Crystal Peak district. Although other notable pockets have been discovered such as: the Museum Pocket by Thelma Hurianek in 1981, the Keyhole Vug by Don Smith in 1986, the Tree Root Pocket by The Collectors Edge in 1997, and several from the Smoky Hawk structure (Majestic, Smithsonian, Poker Chip, The 992), the Lucky Monday pocket is exceptional due to the size of the pocket, the vivid blue and lustrous nature of the amazonite crystals, and the deep black, big and lustrous smoky quartz. Many specimens of exceptional aesthetics and near-pristine condition never seen before were produced from this pocket.



*4.8 cm genthelvite crystal shown in photo above. J. Scovil photo.*

*Second opening of the pocket is showing up. Ch. Borland photo.*

*Working in the Lucky Monday pocket, note pegmatite vein. Ch. Borland photo.*

*Freshly collected specimen. J. Dorris photo.*

The Lucky Monday pocket was a horseshoe shaped cavity with each side opening 0.75 m across and penetrating the wall for 1.5 m. The cavity averaged 30 cm in thickness and in some areas, 45 cm. Both sides of the shoe contained excellent combination specimens; however, despite the larger than average number of good groups, more than half of the pocket had been destroyed by natural processe.

As usual, the cavity had ruptured and later collapsed, but sufficient mud and clay helped cushion the ceiling crystals as well as protect them from subsequent secondary minerals and oxides. Most of the contents were loose and extracted by hand. After the breakdown was removed, the top plates were easily pulled free of the pocket clays. The bottom plates were more troublesome and had to be chiseled free, using pneumatic chisels. About 60 percent of the pocket was filled with goethite rich clay, had crystal contacts of varying degrees, or had been shattered, and produced no significant specimens. It took six days to completely excavate the pocket and pack the contents, which eventually filled 55 flats (a box approximately 10 cm deep by 28 cm by 40 cm). Cleaning and piecing together the loose pieces took over a year and final cleaning and preparation took another six months.

*Specimens recovered from the pocket. J. Dorris photo.*

The result after final preparation of the specimens was fourteen large museum quality specimens (over 10 cm plates). The largest specimen, dubbed the "Porcupine," measured 32 cm in length and had seven major smoky quartz crystals reaching to 15 cm and several smaller smoky quartz crystals on a bed of vivid blue amazonite crystals. Fifteen smaller museum quality specimens, between 7 and 10 cm bases, were also recovered as well as approximately 50 small amazonite groups without smoky quartz. Over 75 single smoky quartz, 5 to 15 cm, and 75 amazonite crystals, 2 to 5 cm, were also recovered. The other contents were too damaged to yield specimens but consisted of several pounds of broken, gem-quality smoky quartz and amazonite rough.

Of particular note, a side pocket was discovered that contained the first genthelvite crystals ever recovered in the Crystal Peak district. Even more surprising, one crystal was quite large for the species, almost 5 cm.

*Tim holding first important specimen collected from the Lucky Monday pocket known as "Two Pillars". J. Dorris photo.*

MINERAL SPECIES FOUND IN THE LUCKY MONDAY POCKET

**Albite variety cleavelandite**

Cleavelandite is the platy variety of albite feldspar. It formed as sparkly, lustrous, euhedral crystal rosettes or laths surrounding other pegmatite minerals in the Lucky Monday pocket. The individual blades are a centimeter in length and have surrounded the bases or filled the contacts between amazonite and smoky quartz crystals in attractive, snow-white mounds and cushions on a few of the specimens.

**Fluorite**

Fluorite occurred in the Lucky Monday pocket in simple cubic crystal aggregates on top of other pegmatite crystals as a later-stage mineral. Typically in these pockets, the fluorite is etched but displays good luster. Color is pale green and blue green. One large amazonite and smoky quartz specimen has a 2 cm elongated fluorite of greenish color attached to a smoky quartz prism edge. Other fluorites were detached from matrix and are not remarkable.

*"Two Pillars" after cleaning. P5M photo.*

**Genthelvite**

A pocket found adjacent to the Lucky Monday pocket held the first genthelvite crystals found in the Lake George district. These occurred as loose, lustrous crystals up to 5 cm across in blocky, octahedral habit. Color is a dark maroon with reddish halos. Three

*George Quist with freshly collected specimen. J. Dorris photo.*

significant crystals and approximately a dozen small fragments were recovered.

**Goethite**

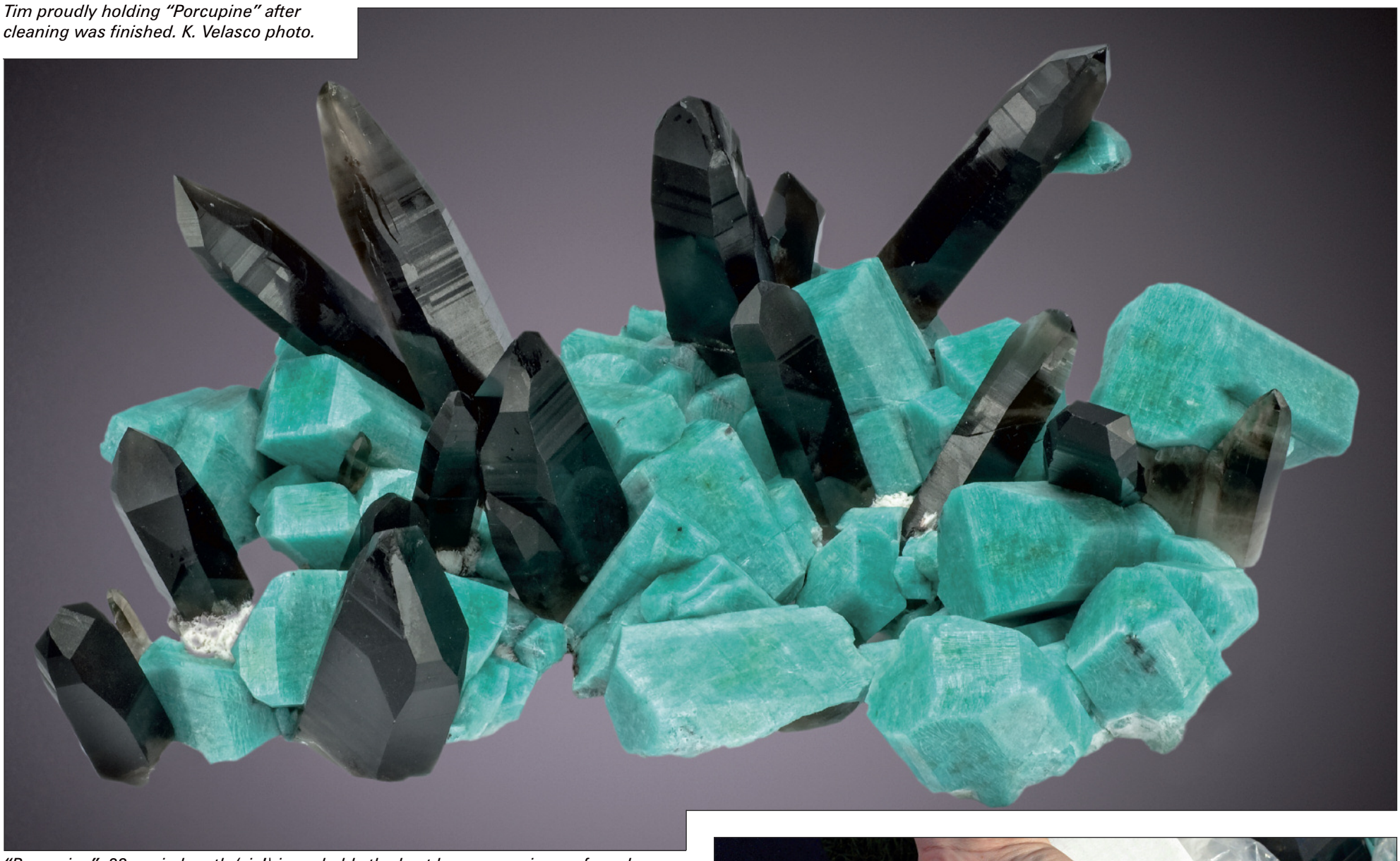
A yellow brown mass of goethite replacing a carbonate, likely calcite, was found in the central area of the pocket. Goethite often forms lustrous, silver to bronze colored, bladed sprays but also frequently replaces carbonate crystals, forming dark brown or black rhombic psuedomorphs. A one centimeter scalenohedral psuedomorph was found on amazonite matrix. All other goethite was unremarkable.

*Tim proudly holding "Porcupine" after cleaning was finished. K. Velasco photo.*

**Microcline variety amazonite**

Although microcline is very common throughout the world, the blue green variety known as amazonite is recovered from only a few areas. Those from the Pikes Peak Batholith exhibit the best crystal form and color combination. Color is attributed to a small amount of lead ion in conjunction with structural water in the presence of ionizing radiation. If the amounts vary too greatly or insufficiently, the color is not as rich. Some evidence also suggests the slower crystallizing pockets with longer radiation exposure are more likely to contain better color as compared with the more rapidly crystallizing pockets. Additionally, microcline with a light body color such as white, as compared to dark buff or gray, also gives rise to more vividly colored amazonite. For unknown reasons, the conditions at the Smoky Hawk were ideal and the majority of pockets contain richly colored amazonite.

*Same specimen still* in situ *in the pocket (upside down above screwdriver termination) and in hand. Ch. Borland photo.*



*"Porcupine", 32 cm in length (sic!) is probably the best known specimen of smoky quartz with amazonite from the Crystal Peak area. It was repaired from tens of small pieces carefully collected by Tim. M. Pospisil collection. J. Scovil photo.*

Amazonite colors vary from pale to deep robin-egg blue. Hue and saturation range from gray muddy colors to bright, vivid colors. Until recently, the vast majority of amazonite crystals from the Crystal Peak district were known for their medium blue-green color, largely of mottled colors of gray green to brownish green, commonly with white splotches. Uniformly colored amazonite is very rare and is indicative of a slightly higher crystallization temperature. When the temperature drops, colorless albite exsolution forms, creating a white mottling known as perthite. The deep, uniform colors are so rare, many people find it difficult to believe they are natural. A few noteworthy pockets found throughout the history of the region, and the recent discoveries of vivid-colored amazonite crystals on the Smoky Hawk structure, are helping correct this perception.

The Lucky Monday pocket produced well-formed and sharply terminated amazonite crystals averaging 2.5 cm but reaching 6 cm, occurring mostly in druses with smoky quartz crystals. No twinned crystals were found. None displayed any white stripes or caps but they all displayed a bright, uniform blue green color. Exceptional luster is exhibited on the crystal domes and to a lesser extent, on the prism sides. Fortunately, only relatively minor Fe-Mn oxides and clay overgrowths were present and were easily removed during cleaning resulting in exceptional amazonite crystals.

**Smoky Quartz**

Pikes Peak batholith smoky quartz is prized for its very deep, near black color. Most crystals exhibit a root beer bottle brown in transmitted light. The smoky color is caused by traces of alu-

*10 cm specimen from the pocket. Pinnacle 5 Minerals specimen. J. Callén photo.*

*Incredible "Porcupine" photograped in Tucson 2013. J. Gajowniczek photo.*

*8 cm specimen from the pocket. Pinnacle 5 Minerals specimen. J. Callén photo.*

minum and the presence of ionizing radiation. Typical smoky quartz crystals are elongated but relatively stubby. About half exhibit normal or prismatic habit terminations. About half also have prism faces that gradually taper to a point (similar to the Tessin habit). Dauphiné twinning, which is an indicator of a high temperature environment, is quite common but frequently difficult to identify. Similarly, the macromosaic structure of the crystals that is revealed by sutures on the prism faces is another high temperature indicator.

It is rare to find smoky quartz crystals in the miarolitic cavities that do not display at least some minor damage, especially to the fragile terminations. Most of the quartz is initially damaged during rupture shortly after pocket crystallization. In severe cases there are no remaining, intact crystals found within a pocket. Nearly all the smoky quartz crystals also display a satiny surface luster as opposed to a glassy surface luster. This satin luster is thought to occur from the natural high fluorine content in the pegmatite volatiles. Many smoky quartz crystals also exhibit later-stage crystal growth, wherein subsequent fluid episodes have caused renewed crystallization. Occasionally, this subsequent growth results in attractive specimens, but it can also become quite unattractive, especially if the secondary quartz grows over or is included with oxides and clays.

The smoky quartz crystals from the Lucky Monday pocket occurred in elongated prismatic crystals and display clean, sharp and lustrous, faces devoid of overgrowth and damage. Most have undamaged terminations and also show surface patterns in the satin luster that indicates probable Dauphiné twinning. They are transparent, gemmy root beer bottle brown when backlit but display as deep black. Smoky quartz crystals range from 2.5 to 22 cm in length and from 1 to 10 cm in diameter. These are easily some of the best quality smoky quartz ever recovered from the district.

**Combination Specimens**

Most of the specimens from the Lucky Monday are exceptional combination specimens of smoky quartz with amazonite with a few having cleavelandite and fluorite associations as well.

*16 cm specimen with dominating big smoky quartz crystal. Astro Gallery specimen. J. Callén photo.*

In addition to the individual qualities of the associated species, the specimens in combination show superb qualities. The color contrast of deep black to vibrant blue green is very strong. The size ratio of crystals is exceptional with the average being two and a half to one. The luster of both the smoky quartz and amazonite is exceptional for the region and the overall appearance shows strong aesthetics and balance, making these specimens highly desirable by collectors.

*Same specimens photographed in two diffrent lightings showing transparency of the quartz crystals. 12.5 cm in length. Pinnacle 5 Minerals specimen. J. Callén photo.*

PERSPECTIVES

A small area on the Smoky Hawk structure remains to be explored and will likely be completed in 2013. It is expected that mechanized operations will produce one or two more high quality pockets. However, each pocket discovery is marked by its own unique appearance and may not directly compare to the Lucky Monday pocket. For example, a future pocket may contain smaller amazonite crystals but with sharply contrasting white caps, or it may contain common microcline. Will any future pockets equal the quality of the Lucky Monday pocket? Only time and luck will tell.

Joseph L. DORRIS
Pinnacle 5 Minerals,
Manitou Springs, Colorado, USA
e-mail: joe@pinnacle5minerals.com

*Unique, big and unrepaired specimen of big quartz with amazonites and fluorite crystal on the side freshly after extracting and after final cleaning, 23.6 cm in length. J. and G. Spann collection. J. Dorris and J. Scovil photos.*

*Joseph Dorris (author) painting showing area near the Smoky Hawk claim.*

# Our Lucky Monday – a great collecting story

Joseph L. DORRIS

In our 30 years of mining, 2011 was off to the worst start of any season. We knew if we did not find a great pocket, it could be the end of our search for amazonite with smoky quartz.

Monday morning, 13 June, things were going badly. We could not start the John Deer 992 excavator. We tried starter fluid, new fuel filters, new air filters, pumped out fuel to drain the air, pumped out water, charged batteries,

*Freshly collected specimen. J. Dorris photo.*

and tried again. Nothing worked. Finally giving up, we brought the smaller John Deer 690 excavator into the main excavation and began work where we had earlier discovered a pegmatite with common microcline. We had been working a new dig site on the Smoky Hawk claim for several weeks and had yet to hit anything significant. With our main machine, the 992 excavator now down, we were facing a terrible season.

My son Tim arrived and he and George Quist (my machine operator and mechanic) resumed work on the microcline pegmatite. I headed up to the camp to recharge some batteries and get some tools. While there, I heard the smaller 690 excavator stop. It meant either two things: that they had paused to collect a pocket – something good, or the excavator was busted as well – something the opposite of good (It broke down two weeks later and remained down the remainder of the season – another major repair bill).

When I reached the excavation, I could see neither George nor Tim and hollered down to see if they had found anything. I expected something like, "Only microcline." No color had yet shown in this section of the excavation.

– *Yeah, I got one* – Tim exclaimed.

When I scrambled down to see, he was leaning back from a small black opening to the right of the pegmatite they had been working, a huge grin on his face. George had a rare grin on his face as well.

– *I can't reach the back* – Tim shoved in his arm to demonstrate.

– *But does it have color?* – I asked.

Tim flipped me a piece of bright blue amazonite. I stared in disbelief. Weeks without color, digging adjacent to a common microcline pegmatite, and then here, on an entirely different pegmatite was the opening to a miarolitic cavity, possibly a huge pocket with color.

– *Any crystals?*

– *Can't tell yet. But I got some smoky shards*.

Tim handed me a chunk of glassy smoky quartz. I immediately spotted the side of a crystal face. It was well formed. We had a pocket!

Tim was reaching in as far as he could, trying to find an amazonite crystal. I knew why. More times than not, the pockets we find are so badly ruptured no crystals remain. We fill buckets with broken amazonite and smoky quartz but not a single intact crystal.

– *Hand me the pick*.

*Another spectacular specimen from the pocket, 14.5 cm. J. Dorris photo.*

At first I thought he might try to break open the opening some more – not particularly wise if crystals could be dislodged and broken. The opening appeared to be 15 cm across by 10 cm high. Instead, Tim inserted the pick handle to its hilt and sat back laughing.

*Tim holding freshly collected specimen known as "X", above photo of the same specimen after cleaning, 12 cm. S. Neely specimen. J. Dorris and J. Callén photos.*

– *It's freaking huge.*

I had to see. I shoved Tim aside and peered in only to see an empty black void.

– *I need a measuring tape.*

– *In my truck on the side door.* – George offered.

I lit out for George's truck and the camera.

There was still no evidence we had quality crystals, but the size of the pocket was noteworthy, no matter what we found. The color was excellent and there was smoky quartz.

Shortly, I was back. Tim had raked out a few more amazonite shards of good color – still no crystals. Some of the smoky shards had some aragonite drippings and iron staining, meaning there was a well-formed void.

He inserted the tape measure.

– *60 cm* – incredible. Then – *90 cm*. Unbelievable. He slid out more of the tape. It stopped at 1.16 m.

– *It's going to be near two meters*.

We all recognized the wall rocks would slope downward and the pocket would dip. It could easily go another meter. It was freaking huge. But did we have any crystals?

No one wanted to remove the broken pegmatite to find out. Like an unopened safe, the cavity could hold an unbelievable treasure, or it could be empty. It was nice to savor the thought of a treasure.

Finally, we got back at it. Using the 690 excavator, George took more of the top off and pushed the working face back so we didn't have any rocks falling on us.

I got the collecting flats. Tim hooked up the water.

– *Well, this is it* – I said. We began pulling chunks of rubble away from the opening.

Slowly it enlarged until the sunlight fell inside. A pile of breakdown greeted us. There were a few amazonite shards and smoky quartz shards, but no well-formed crystals, which, in a way, could be good. We hoped the ceiling plates had separated and settled to the floor of the pocket. If the pocket held sufficient clay, the ceiling plates would have been protected and be in good shape. If the pocket had held little clay, the forceful rupturing

*Same specimen when dirty and after first wash. J. Dorris photo.*

*Specimen known as the "Behemoth" still in situ. Ch. Borland photo.*

after pocket formation would have damaged the quartz crystals.

A few crystals remained attached to the side.

– *That's a good sign* – Tim pointed them out.

But the quality did not look that great. They were coated with oxides and aragonite drippings, possibly silicates, which would be even worse. They were also stubby and the amazonite was shattered.

The cavity mouth now open, Tim started removing some of the breakdown. Chunks of aplite and graphic granite began showing. He began tossing out the chunks of pegmatite, looking for any crystal contacts. He fingered a chunk of pegmatite about 5 cm across and began to toss it out. He hesitated. Now he pulled it back slowly, like unsheathing a knife – two knives – two long smoky quartz came into view. He tipped the piece up. The base was a mass of brightly colored amazonites. No damage. Perfect terminations. Unrepaired. Unheard of. Later, we call it the "Two Pillars."

We sat in stunned silence before we filled the woods with our wild whooping.

If we did not find another specimen in the entire pocket, we had just saved our season.

This was our **Lucky Monday**.

*Freshly extracted "Behemoth". Ch. Borland photo.*

We wanted to keep collecting, but now had a problem. The pocket drifted into the working face directly under one of our topsoil piles. Fortunately, it did not drift in the direction of the 992 excavator which was broken down above us several meters to the left. Yep, we found the 992 pocket under the 992 excavator at season's end.

– *We got to bury it and move that topsoil pile* – I broke the obvious news.

Neither of us wanted to do so. Anytime we buried a pocket we risked ruining some crystals and worse yet, hitting it with the excavator bucket when attempting to reopen it.

Begrudgingly, Tim and I packed the pocket with blankets and newspapers and then marked it with some flagging tape as telltale markers for when we would unbury it.

George took the small excavator to the top of the hill and worked his way back down to get at the topsoil. The day closed with him swinging the dirt a few meters to the side and below the pocket.

We spent the night rather worried. Although we were a couple of hundred meters from the excavation, more than once we had had claim jumpers come in during the night to rob us. I checked the pistol more than once and took our dog, Baxter, out to check the perimeter a few times.

– *It's buried, dad* – Tim kept reassuring me. And it was – under a good 3.5 m of rock. Thieves could dig all night and never reach it. But having already lost a multi-thousand dollar pocket once, I was imagining the worst.

*Amazonite with quartz in situ. Ch. Borland photo.*

Early morning, we had visitors. I was trying to be polite and showed them around, but I was happy to see them head over the hill to where they were collecting. I wanted this pocket kept quiet.

*Joe (left), Ray Berry (center), and Tim examining "Behemoth". Ch. Borland photo.*

*"Behemoth" after first wash. Ch. Borland photo.*



*21 cm "Behemoth" specimen is one of the best known from the area. M. Pospisil collection. J. Gajowniczek and J. Budd photos.*

Using the excavator, we reopened the pocket, using our hands to remove the last bits of dirt. The blankets and packing had protected it perfectly. We brought in the water so we could carefully wash out the contents and keep from chipping any crystals. Already we knew the quality was superb. A good number of the smoky quartz crystals we had found had perfect terminations.

We took out about a dozen small amazonite groups, some with smokies (*smoky quartz* – ed.). Additionally, we collect all the single crystals as some will be reattached to matrix from which they have naturally separated. Painstakingly, we catalogued and photographed their location for helping us find these fits later on. We also tried to collect pieces in

*7,5 cm quartz with amazonite. J. Starr specimen. J. Budd photo.*

the same order they were located in the pocket and packed them into the mineral flats in order.

In one section we began finding some exceptional smokies that were up to 12 cm in length and some beautiful 2 to 5 cm amazonites and small amazonite groups. Very few of the crystals were in attached clusters, which was disappointing, but not surprising.

At this point, we avoided collecting the floor plates. If they were intact, we would need to chisel under them and pop them up to remove them safely without damage. Often these plates are in worse condition than the ceiling plates, although they are often larger and somewhat more intact. Mud, oxides, and secondary fluids tend to corrode the floor plates.

*Specimen known as "Forest" still in parts during preparation. J. Dorris photo.*

*Finished "Forest" specimen, 15 cm. E. Long collection J. Scovil photo.*

– *Crap. Goethite psuedomorphs* – Tim handed me a brown lump.

I took the piece – an amorphous glob of yellowish brown dense yuck. A fragment of blue stuck out from it. He handed me more.

– *It's too thick to remove* – he said.

I recognized he was right. We had prayed we wouldn't run into this kind of problem.

– *Where does it seem to be leading?*

– *Off to the right side. The whole section is cemented together.*

He backed out of the pocket, another chunk in his hands.

– *Well, what we got so far is good.* – I waved at the pieces we had collected.

Tim began gathering up the smokies, examining them. He took ahold of some of the amazonites and began checking for fits. He immediately found a couple.

– *These are all going to go together,* – he said excitedly. – *This is going to make one freaking huge plate.*

He dove back into the pocket. – *We gotta get all the pieces.*

He handed me every tiny scrap. Dutifully, I wrapped them. The section he was working eventually filled four flats.

Later, these pieces did fit together. The "Porcupine" came from this section of the pocket and consists of 38 fit sections and crystals. It is arguably one of the finest specimens, if not the finest, from the Crystal Peak district.

We took turns collecting specimens until the day's end. It looked like the pocket was about finished. Everything to the right was cemented together except for a section at the far end which we had not excavated. The left side had been collected. In the morning, we would work on the floor plates. We again packed the pocket for the evening.

To get to the floor plates we had to cut the working face back on each side of the pocket. That meant bringing the top down to within a meter of the opening and then cutting the sides back to where they extended beyond the length of the pocket. We also trimmed the front until we were right up to the floor plates.

*Same specimen as repaired one and still in pieces during preparation process. J. and G. Spann collection. J. Callén and J. Dorris photos.*

George began by cutting down the top and then he cut the left side, searching for any pegmatite that drifted in that direction and trying to get beyond the cavity. Next, he began cutting about a meter to the right side of the pocket. The first cut on the right exposed another pegmatite. It looked promising. I had him move farther to the right and continue cutting until he no longer hit pegmatite.

This was incredible. Often when one pegmatite produced a pocket an adjacent one would as well. It did not yet show color, but the chunks of smoky quartz and pink feldspar were large.

– *Better give me a minute* – I signaled to George.

I worked the pegmatite with my pick, knocking loose some pieces. It kept enlarging. Tiny gaps appeared between the crystals.

– *It's gonna open* – I shouted back to George. Tim was trying to examine the old cavity and now came over to investigate.

– *It's green* – I shouted. I wrenched out some chunks of amazonite. – *This is going to open, Tim. I just know it.*

– *We've been fooled before* – Tim cautioned.

George had come into the excavation to watch.

With the next swing of my pick, I broke into a cavity, and pulling out a few chunks of pegmatite, a black hole stared back at us.

– *It's deep* – I said. I slid in a screwdriver. There was open space behind. - *It's going in the direction of our other pocket.* - I observed. I pulled free some more chunks, and then, there it was, a perfect glassy smoky quartz, identical to those we had been pulling from the other cavity.

I turned and looked at Tim. He and I were thinking the same thing.

– *They're going to connect!* - I shouted – *They're the same pocket!*

Collecting was now going to become a bit more problematic because there was a greater danger for the ceiling to collapse into the right pocket section, but what a problem to have. I had George continue cutting the right side until we determined the extent of the right side. We removed more from the top on the left side and then all three of us, working together, removed the heavy ceiling rocks, exposing the bottom plates on the left side.

As it turned out, we discovered the bottom plates were mostly destroyed and we recovered only a few minor crystals. The material on the right edge of the bottom was encased in goethite and equally worthless. Only a small area toward the back remained promising.

*Aesthetic 8 cm specimen from the pocket. J. Callén photo.*

Each night, we religiously packed any exposed pocket and buried it. Each morning, we unburied the pocket and

*Freshly collected specimen during first bath, 10 cm. M. Oleszczuk collection. J. Dorris photo.*

continued our work. My friend Chuck Borland arrived from Montana and offered another set of welcome hands. Chuck customarily does most of the photography and washes some of the pieces for checking fits and quality. Tim is the prime person for excavating the pockets. I usually keep track of specimens, wrap, and log material. George runs the water and the chipper when used. But we all trade off as well. Who could not help but want to reach in and pull out a fine specimen never before seen by a human?

We took more time than usual collecting and screening for fragments. Any missing tip could represent high value lost. Any cleaved amazonite could be critical for a repair. Tim also spent more time washing pieces and checking for fits. If they could be found in the field, it saved time later on and often resulted in recovering a specimen. Tim has an uncanny knack for memorizing the location and shapes of pieces. The more he spends time studying the pocket, the greater our chances are for fitting the specimens back together later on.

While Tim and George continued collecting the left side, working farther to the back and toward the connection with the right side, Chuck and I began working the right side cavity. We worked for only a few minutes before I exposed a nice combination piece completely in-

*Last good specimen, known as "V", collected from the Lucky Monday pocket still in situ. Ch. Borland photo.*

small smokies with several nice amazonites. This is a record for the Crystal Peak district, I told myself. It is the largest smoky yet found of this quality with quality amazonites. We later call it, "The Behemoth".

We were fairy dancing. The incredible pocket is continuing.

About this time, the great pieces must have been giving off some crystal

*"The V" after preparation, 21 cm. J. Dorris photo.*

tact. I also uncovered the tips of some smoky quartz rising from the bottom of the pocket. They were in better condition than those that had been on the left side, which meant there could be some nice floor plates. Carefully, I packed this section so I could continue removing the breakdown. Pulling out a couple more chunks, I broke through into the rear of the pocket. It extended into blackness for about a meter. I was now certain the two cavities connected.

I had Tim pull out the next specimen. It turned out to be incredible – a multiple-termination quartz like a castle with incredible amazonites and a fluorite attached, and, it was unrepaired.

Tim pointed to a 5 cm smoky quartz poking out from the floor rubble.

– *Want to pull out that one?*

– *Nah, you go ahead.* – I was asking myself who cared about a 5 cm smoky.

Gently, Tim checked the piece. The entire floor moved. He tipped the piece up, and out of the floor rose a behemoth quartz crystal about 13 cm in length by 10 cm wide! Connected to it are other vibes or something. The collectors who had been visiting decided to return to our side of the mountain, another field collector and his buddy came up the road just to say hi, and my good friend, Ray Berry, came over to visit.

– *Now, don't go spilling the beans* – I cautioned. I was pretty certain they recognized they were seeing some of the finest specimens ever collected in Colorado. – *We have to clean them yet. I don't want the word getting out.*

Well that worked all of about 5 minutes. Congratulations poured in nonstop for the next several weeks.

The next day, we continued to pull out some more great pieces, generally smaller. Eventually, we exposed and removed the right side floor plates. Some were intact and were in better condition than those on the left.

The two cavities had now connected and we found great crystals throughout the back section of the pocket. Unfortunately, the front of the right side was shattered, as was the far back. There was an abundance of single crystals, not

I was careful not to wiggle the piece. Often a smoky quartz tip can be resting behind another crystal or be wedged behind some rubble and even a wiggle can chip the tip. I washed more, removing more bits of gravel and pegmatite until the piece was barely sitting in place. Carefully, I pulled it up and out. Holding it down but bringing it out to where everyone could see, I slowly turned it over. Many times we'd be met with disappointment, thinking we had a good group, only to find missing or damaged crystals. This one was superb. A large, 7 cm smoky connecting to a large, 7 cm amazonite, forming a "v" turned over into view. Additional smoky quartz and

*"The V" still dirty just after extracting. J. Dorris photo.*

like the groups we had pulled out, but good, nevertheless.

Tim kept assuring me – *It's okay, I can piece some of these together*.

He was correct. One of the best plates came from here, later called "The Forest".

Tim continued working the final section.

– *Here, want to pull this one out?* – He backed out of the cavity.

– *Sure.* – I wasn't about to let another one get past me. Tim had exposed the bottom of a potential crystal plate. It was about 10 cm across and likely one of the final plates.

Carefully, I finished removing some of the surrounding rubble, washed the material away with the water, and gently lifted on the specimen. It was loose. Still amazonite crystals surrounded it. Another incredible piece from the incredible pocket.

We finished the Lucky Monday Pocket the following day, finding some small groups but nothing significant. Having spent six full days collecting, I still had the main excavator to repair and some other prospects to check. We filled the working face, hoping another incredible pocket would be found deeper in the mountain at a later time but realizing we may have just found the most spectacular pocket ever discovered in the Crystal Peak district.

Joseph L. DORRIS
Pinnacle 5 Minerals,
Manitou Springs, Colorado, USA
e-mail: joe@pinnacle5minerals.com

*Tim and Joe proudly showing two great specimens recovered from the Lucky Monday pocket – "The Porcupine" and "The Behemoth". J. Gajowniczek photo.*

*Sahatany Valley in central Madagascar is one of the most famous and productive pegmatite fields. J. Gajowniczek photo.*

# Giant liddicoatites from Estatoby pegmatite, Madagascar

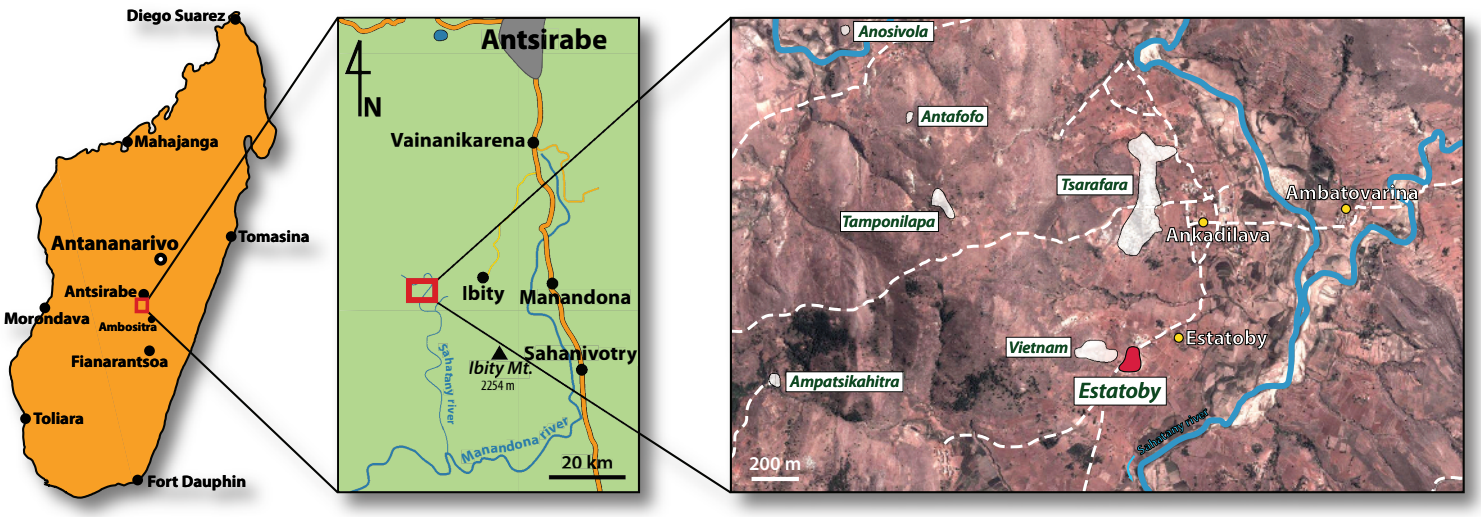
Federico PEZZOTTA and Tomasz PRASZKIER

*Continued from page 1*

## LOCATION AND GEOLOGY

Madagascar is very rich in pegmatites and gem deposits because of its complicated geological history. The central and eastern parts of Madagascar are a shield built of Precambrian metamorphic and magmatic rocks. In some areas these rocks were heavily intruded by magma during the Pan-African Orogeny. In Madagascar, the consequence of this long-lasting and multi-stage process is an abundance of large pegmatite fields and pegmatite rich areas of an extremely varied chemical and mineralogical composition.

Sahatany Valley is one of the most famous and best described pegmatite fields in Madagascar which is still productive. The valley is formed by the small Sahatany River and is about 30 kilometers long and quite wide. It is situated at the foot of Ibity Mountain (2292 m high), about 30 km SSW from Antsirabe, a relatively large town and the center for mineral and gems dealing.




*Map of Madagascar showing inserts of the Sahatany Valley area and the location of the pegmatites in the area (white color) including Estatoby pegmatite (red).*

The center of the valley is about a one hour drive from Antsirabe by main road (RN 7) and then a local road to the Ibity village. From Ibity it is about a one hour walk to reach the main pegmatite field. Sahatany Valley is considered one of the more easily accessible Malagasy mineral localities. The majority of localities in Madagascar are very difficult to reach even by 4x4 vehicle. For this reason, Sahatany Valley is one of the most popular destinations for mineral collectors and local and foreign dealers.

*View of Estatoby workings (white dumps) and Vietnam workings located above. J. Gajowniczek photo.*

*Kids in the Sahatanny Valley are always excited to see white people visiting the area. J. Gajowniczek photo.*

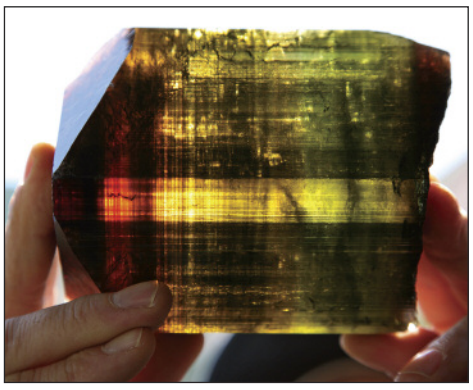
Geologically, Sahatany Valley is located in the eastern part of the Itremo tectonic unit, which is composed of metamorphic rocks including schists, quartzites, gniesses, and marbles. This wide variety of rock types, each with a different degree of resistance to erosion, results in a diverse landscape – the quartzites being the most resistant to weathering build the high jagged Ibity and Kiboy Mountains, while the marbles and schists form gentle hills and valley bottoms.

The geology of the area is additionally complicated by the occurrence of granitoids and gneisses, probably composing an old crystalline basement underlying the original sedimentary sequence, and by the intrusion of gabbroic and granitoid plutons. Gem bearing pegmatites very likely belong to the same magmatic cycle which generated granitoid plutons, dated to be about 530 mya (Neoproterozoic age).

The Sahatany Valley pegmatite field extends over 150 square kilometers and contains more than 100 large pegmatites which are typical vein pegmatites hosted in the marbles. The majority of pegmatites occurring in the Sahantany Valley are of the Rare Element Class (LCT family – lithium-cesium-tantalum) with dominating subtypes: lepidolite, elbaite and "danburite". A few of them belong to the Beryl-Columbite Subtype.

The pegmatites dip at various angles, from almost horizontal to vertical and have a diverse relationship with the "bedding" of the host rocks, from concordant to discordant. They also range in size from small (a few meters long) to quite large (several hundred meters long).

*View of the central part of the Sahatny Valley with white dumps of the Tsarafara and Estatoby workings. J. Gajowniczek photo.*



*An 11 cm crystal of multicolor liddicoatite from Estatoby. M. Oleszczuk collection. F. Pezzotta photo.*

*Workings in Estatoby. J. Gajowniczek photo.*

Some of the pegmatites in the area are very rich in gem crystals what has resulted in extensive prospecting and mining. The most famous minerals occurring in them are certainly tourmalines forming multi-colored, gemmy, lustrous and well-terminated crystals. The other varieties of colored tourmalines such as red, green, pink, blue, yellow and violet are also well known from the area. Additional gemstones mined in the valley are beryls (pink, blue and polychrome), danburite, and kunzite. As a result of extensive gemstone mining, a number of other rare and interesting species have been found (manandonite, bityite, rhodizite, londonite, behierite etc).

*One of many primitive shafts in Estatoby. J. Gajowniczek photo.*

The most important gem-producing area is located in the central part of the Sahatany Valley near the village of Ankadilava, an area dominated by Mount Ilapa. The Tsarafara and Estatoby pegmatites, located there, are part of a large pegmatitic system, extending on the surface for over one kilometer in the foothills of Ilapa Mountain. The mines in the area are divided into two groups: *Tamponilapa* (which means "the top of Ilapa Mountain") and *Antanetinilapa* (which means "the cultivated fields of Ilapa"). The second group includes *Tsarafara* (which means "the beautiful Fara" – Fara was a woman who directed mining works and the buying of gemstones in the seventies), and *Estatoby* (which means "the field to the east"). Diggings on the side of the hill dominating Etatoby are known as *Vietnam*.

*Woman sifting kaoline, product of weathering feldspar and mica, looking for gem fragments of tourmalines. J. Gajowniczek photo.*

*Miners working in Estatoby. J. Gajowniczek photo.*

Most of the gem bearing pegmatites of the central part of the Sahatany Valley are claimed by a Malagasy company (Ruby-Red Madagascar s.r.l.) based in Antananarivo. This company is currently operating two mines – one located in the northern Tsarafara, and the second at Ampatsikahitra, located on the southern side of Ilapa Mountain. In addition to its own commercial operations, the company also allows members of the local population to conduct several small scale mining projects. However, activity by miners, brokers, and dealers from outside the local area is prohibited. This restriction is strictly enforced by the local authorities including the police.

*Workings in Estatoby with numerous primitive shafts. J. Gajowniczek photo.*

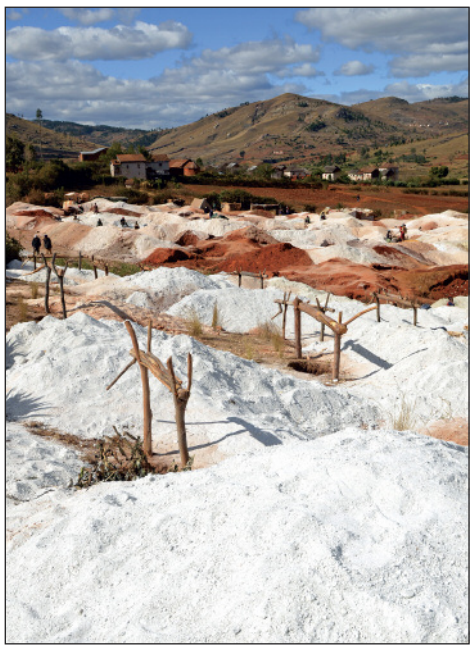
DISCOVERY AT ESTATOBY

The majority of the workings in the Sahatany Valley are located in heavily eroded (kaolinized) pegmatites, which are quite easy to dig. Therefore, most minerals are extracted as loose crystals. Multi-mineral specimens are found much more rarely. Because of the very primitive methods of mining, plus the focus on gemstones, the majority of mineral specimens come out damaged or incomplete. Also the Estatoby pegmatite is heavily eroded, at least in the main part.

Almost all workings in the valley are small very primitive shafts operated by a family or a group of miners. Sometimes shafts are over 30 meters deep, with no ventilation. Candles and primitive lamps are used for lighting. Tools are usually very simple hand tools.

Areas with intense exploitation are usually covered by snow-white dumps (because of kaolinite) and today the area looks like a battlefield with scores of holes and dumps etc.

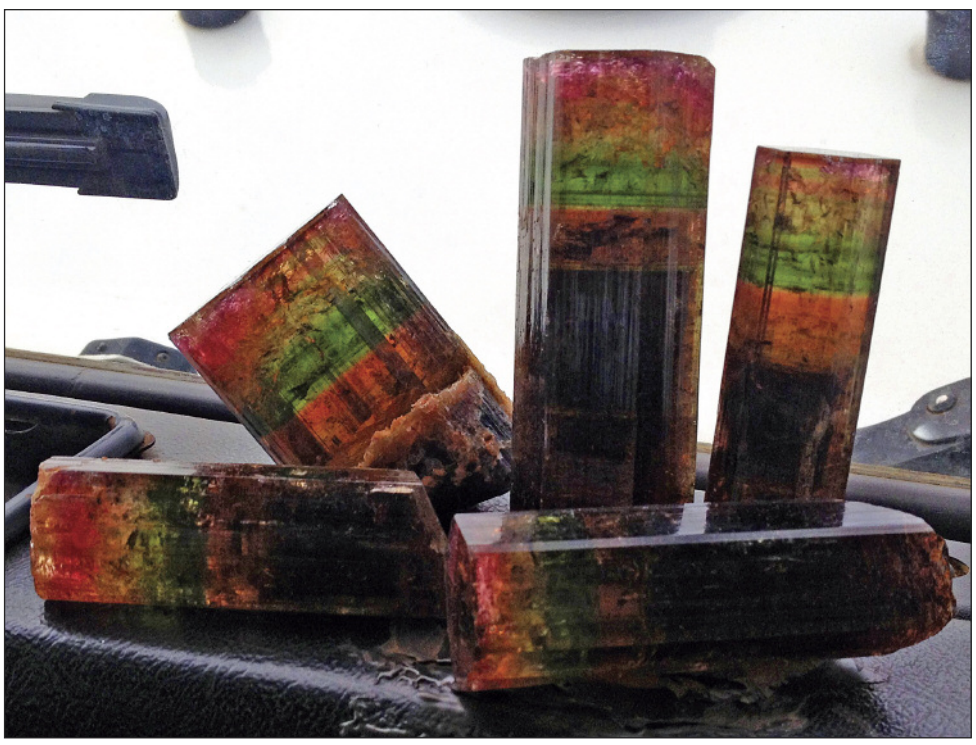
Before 2012 Estatoby was characterized only by some superficial workings in colluvial and eluvial deposits formed by the erosion of the pegmatitic veins outcropping on the side of the hill (Vietnam), and the erosion of some pegmatitic veins existing at depth. These workings produced a minor quantity of gem-quality polychrome tourmaline and pale pink spodumene (kunzite). Below the colluvial and eluvial deposit, a few pits in the past encountered a kaolinized pegmatite, but without finding anything of interest.



*Workings in Estatoby with snow-white dumps colored by kaoline clay. J. Gajowniczek photo.*

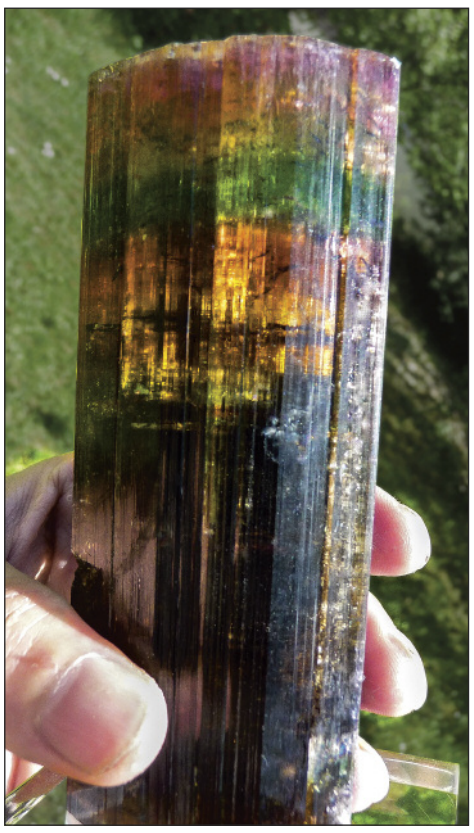
However in June 2012, a group of seven local miners directed by a well known and experienced miner named Pieró started working a pit. The prospect

*Whole families are working for gems in Sahatany Valley. Usually men are working underground and women and kids are sifting dump material. J. Gajowniczek photo.*



*Group of multicolored liddicoatite crystals photographed on the front of the car right after they were collected in the mine. F. Pezzotta photo.*

*Miners working in narrow tunnels following pegmatite collecting fragments of gemmy rubelites. M. Lorenzoni photo.*



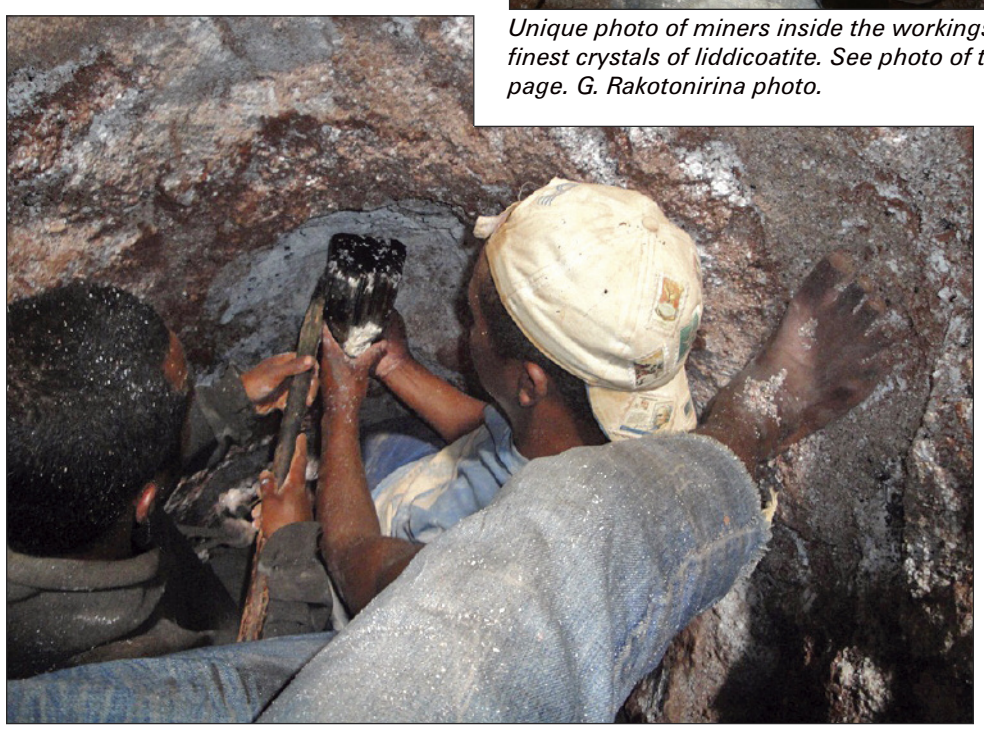
*Big, gemmy multicolor liddicoatite crystal from the find, weight 530g. K. Neumann collection and photo.*

followed traces of polychrome tourmaline which formed a thin vein dipping at a high angle into the kaolinized pegmatite. During the second week of June, at a depth of about 8 meters the thin vein brought the miners to a coarse grained sub-horizontal partially kaolinized, pegmatitic lens which was rich in cleavelandite aggregates and large blades of pink-purple lepidolite. Digging inside this lens they broke into a large pocket filled with whitish clay, from which they started recovering large crystals of polychrome tourmaline. During the first day of working the pocket, they found over 30 kg of crystals, including one specimen 26 cm long weighing 4.6 kg. This crystal had exceptionally sharp and lustrous faces and strong color variation (see description below). It is one of the two best polychrome tourmaline crystals ever found in Madagascar. The large size of the crystals from this pocket is completely unusual for the locality and for this area in general.

Since the pocket extended in all directions downdip, the pit soon became too narrow and the pocket began to collapse. Therefore, the next day they decided to abandon the pit and to dig a second much larger one nearby. Unfortunately, they were unable to keep the discovery secret. A few days later while working the second nearby pit, they were surrounded by other local miners who had heard of the discovery and rushed to start developing pits of their own.

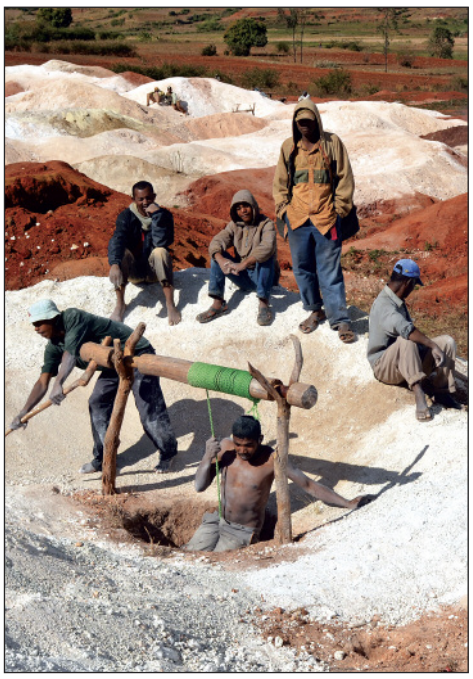
In one week of hard work Pieró and his team mined many crystals from the pocket, but since the cavity extended horizontally for several meters, at least two other groups of miners were also able to reach the same pocket from other directions. The three groups of miners fought over who would collect new crystals from the pocket. In spite of this dispute, many more crystals were recovered, including one weighing 5.2 kg of the same superb quality as the first one. A large quantity of tourmaline rough of carving quality was also recovered. The total production of the pocket was about 70 kg of crystals, with individual crystals weighing from a few hundred grams to over 7 kilos, and about 300 kilos of carving quality tourmaline rough. Only a small number of the recovered crystals were collector quality. Many were too dark or were naturally damaged or incomplete.

During a single two week period, over 200 miners came to work in the Estatoby, an area of less than 1000 square meters. At least 300 more people came to the area trying to take advantage of the newly discovered tourmaline. Many primitive shops and bars grew up around the workings. However, most of the production of the pocket was controlled by local dealers who had entered into partnership with the miners. During the next two months, about 1.5 tons of rough tour-



*Unique photo of miners inside the workings in Estatoby extracting one of the world's finest crystals of liddicoatite. G. Rakotonirina photo.*

*Unique photo of miners inside the workings in Estatoby extracting one of the world's finest crystals of liddicoatite. G. Rakotonirina photo.*



*Miner lowered down to the shaft . J. Gajowniczek photo.*

*Unique photo of miners inside the workings in Estatoby extracting one of the world's finest crystals of liddicoatite. See photo of this crystal in the left lower corner of this page. G. Rakotonirina photo.*

*23 cm in length (sic!) and over 5 kg crystal of liddicoatite, one of the best from the find, shown also at the photos above when extracted. Because of its thickness, it is very difficult to backlight to see strong color zonation. J. M. Shaw collection. G. Rakotonirina photo.*

*Ajoined crystals of liddicoatite with strong color zonation, 5.5 cm in length. A. Watzl Jr. specimen and photo.*

maline were recovered and traded locally, but only a very limited quantity of small (up to a few hundred grams) tourmaline crystals was found in some small satellite pockets.

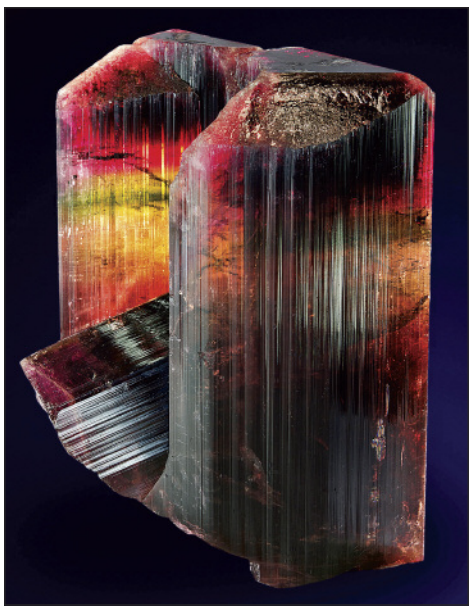
By September 2012 the number of miners had dropped to about 50 and thereafter gradually declined to the 25-30 miners who currently work the mine (May 2013). Further production from this area will be hampered by ground water inflow into the pits which makes the use of primitive mining methods impractical.

The lack of surface exposures, and the poor exposures at depth in the pits, make it difficult for geologists to develop a model for extending this productive zone. Therefore, the future potential of this place remains unknown.

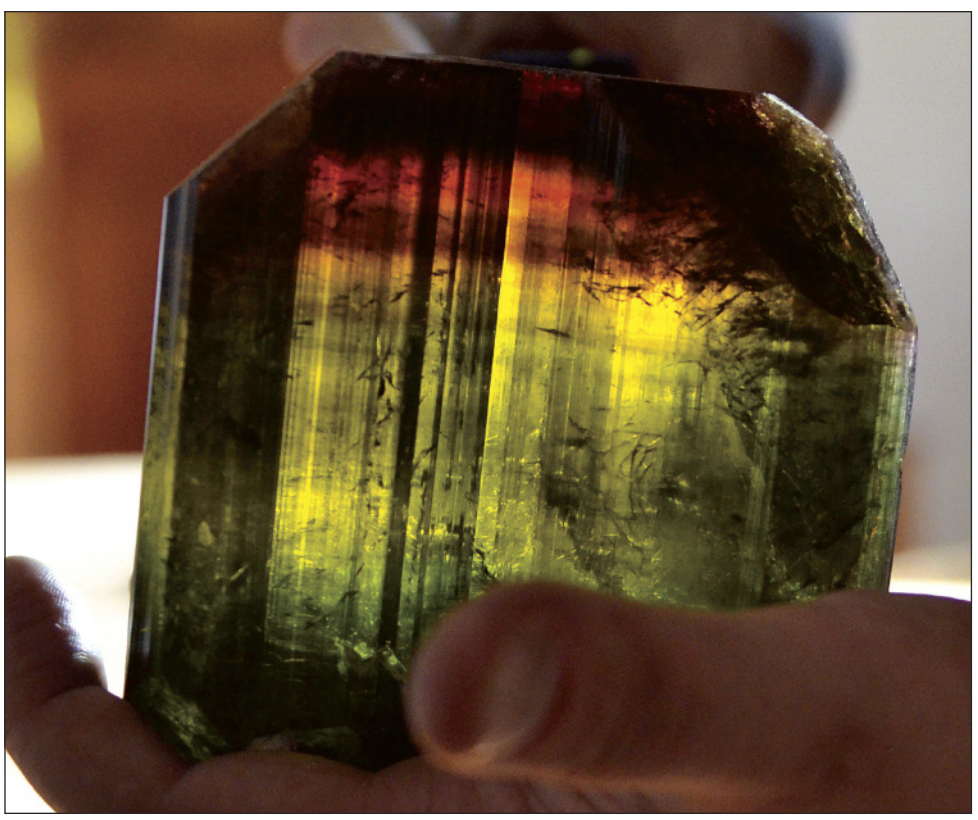
*Multi-color liddicoatite crystal, weight 800g F. Pezzotta photo.*

## MINERALOGY

The mineralogy of this pegmatite seems to be very simple, and the minerals found in the pockets are the same minerals which compose the coarse grained pegmatitic rock. The following minerals are present: milky white to pale quartz var. citrine, microcline (more or less corroded to spongy aggregates), albite variety clevelandite, "lepidolite" in large blades, tourmaline ranging in color from dark green-brown at the core of the base to multicolored, and deeply corroded large crystals of danburite. Rarely, small octahedral crystals of a pyrochlore-group mineral have been observed both frozen in the rock and as inclusions at the base of tourmaline crystals.



*Big cluster of liddicoatite crystals showing strong color zonation when backlighted, 13 cm in length. Watzl Minerals specimen. A. Watzl Sr. photo.*



*One of the big multi-color liddicoatite crystals, 11.4 cm in length. M. Oleszczuk collection. J. Gajowniczek photo.*

*Same cluster as shown in the photo on the left revealing a differnt color when backlit from a different angle. Watzl Minerals specimen. J. Callén photo.*

*Simillar specimen photograhed when still dirty shortly after it was collected. J. Gajowniczek photo.*

Estatoby tourmalines are impressive for their size, sharpness, and exceptionally complex color zoning. The crystals are typically very glassy and transparent but the largest crystals, because of their size, can be fully appreciated only with strong backlight.

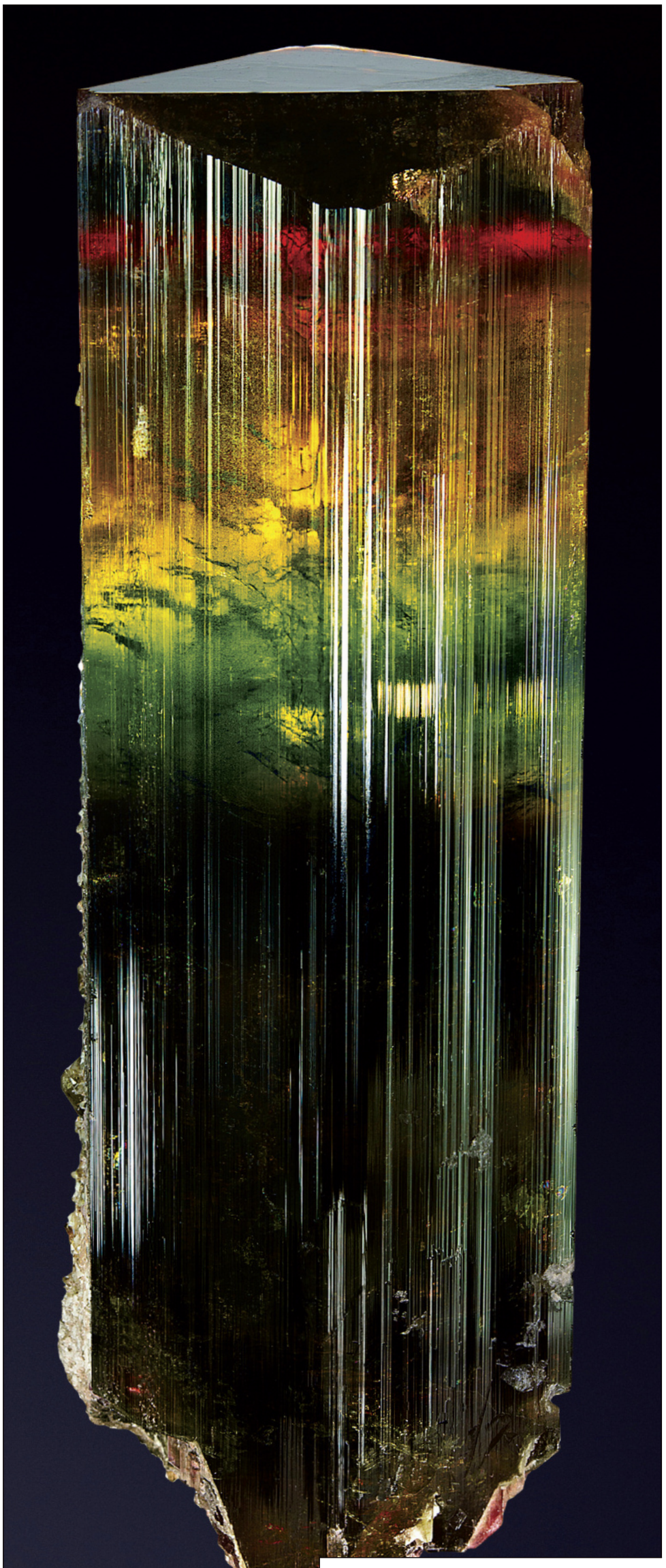
From a study of the specimens produced it is clear that at least two large but different cavities (likely close to one another) were encountered. Two types of crystal morphology and two types of color zoning are present: the first type, which appears in the first Pieró find, is characterized by a large pedion face at the termination, modified on the sides by small faces of trigonal pyramid, and by a deeply red growth sector of limited thickness at the termination; the second type is characterized by dominating pyramidal faces at the termination, with a small triangular pedion face at the top, and by a much thicker deeply red growth sector at the termination. Crystals of the second type are in general less elongated. It is important to note that, in both cases, the termination corresponds to the antilogous pole of the crystals.

Three different sectors can be distinguished in the largest complete crystals. Each sector includes about one third of the length of the crystal.

When the lower sector is viewed through the prism faces, it appears to be dark reddish-brownish in color, and is characterized by a zoning developed both across the c axis and in the direction of complex and steep termination faces. This sector is typically suitable for cutting nice zoned slices, which have a large vivid red core with a centered darker triangle, surrounded by a multicolored thick sector with numerous growth zones of green, yellow, pink, and red.

The intermediate sector is a rather homogenous vivid green to yellow-green

*Elongated liddicoatite crystal from one of the side pockets showing different colors and habit, 11.4 cm in length. M. Oleszczuk collection. J. Gajowniczek photo.*



*27 cm in length (sic!), this is the biggest and probably the best liddicoatite crystal from the find, strongly backlighted it is showing incredible color zonation. Watzl Minerals specimen. A. Watzl Sr. photo.*

color, and represents a growth zone developed mostly in the direction of the c axis.

The upper sector is characterized by a growth zone only in the direction of the c axis, with large pedion faces, resulting in a strongly polychrome appearance looking through the prism faces. In a few centimeters it is possible to observe tens of thin and sharp color sectors, with different varieties of green, yellow, pink, and red color, sharply overgrown by a thick sector in which red to vivid red color is dominant.

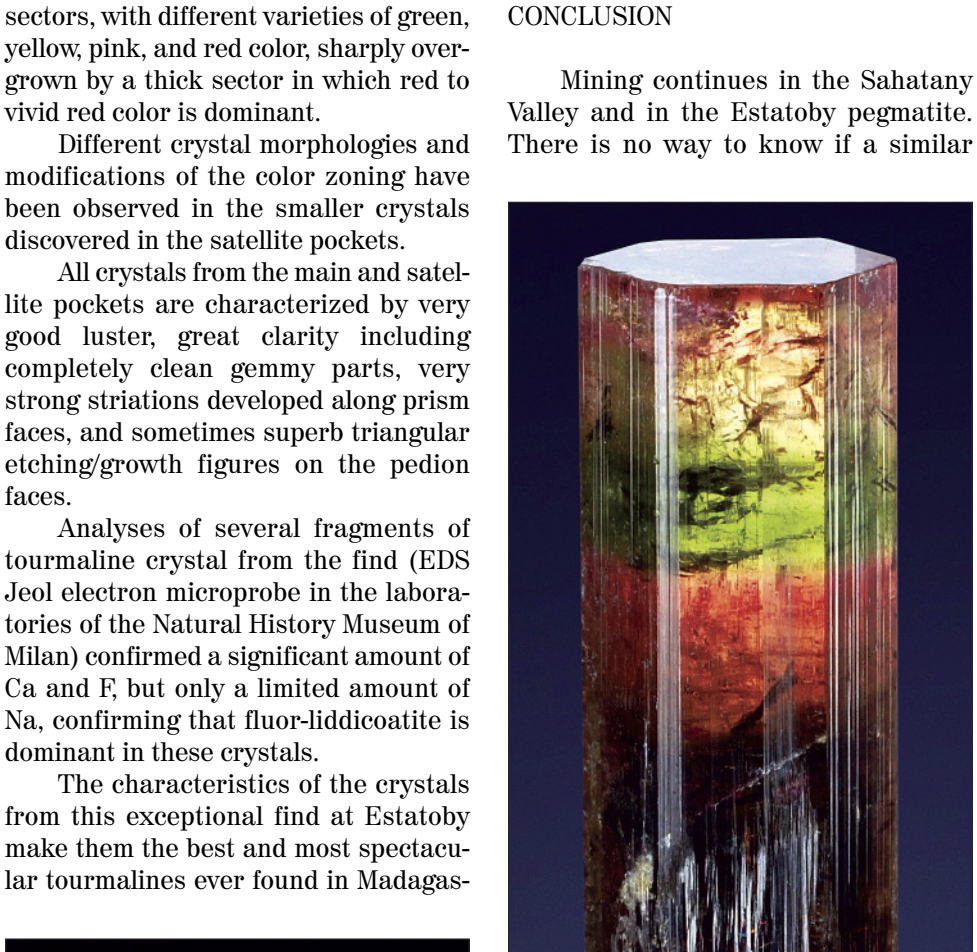
*Etching figures on pedion termination of the big liddicoatite crystal. M. Oleszczuk collection. J. Gajowniczek photo.*

Different crystal morphologies and modifications of the color zoning have been observed in the smaller crystals discovered in the satellite pockets.

All crystals from the main and satellite pockets are characterized by very good luster, great clarity including completely clean gemmy parts, very strong striations developed along prism faces, and sometimes superb triangular etching/growth figures on the pedion faces.

Analyses of several fragments of tourmaline crystal from the find (EDS Jeol electron microprobe in the laboratories of the Natural History Museum of Milan) confirmed a significant amount of Ca and F, but only a limited amount of Na, confirming that fluor-liddicoatite is dominant in these crystals.

The characteristics of the crystals from this exceptional find at Estatoby make them the best and most spectacular tourmalines ever found in Madagascar. Specimens from this find are among the best liddicoatites in existence.



*Liddicoatite crystal from the Estatoby find with skeletal termination offered for sale in the Sahatany Valley. J. Gajowniczek photo.*

*Doubly terminated liddicoatite crystal from one of the side pockets showing different colors and habit, 6.4 cm in length. Spirifer collection. J. Scovil photo.*

CONCLUSION

Mining continues in the Sahatany Valley and in the Estatoby pegmatite. There is no way to know if a similar pocket will be ever found, but there is a good chance that smaller pockets with smaller crystals may be found in the future.



*Liddicoatite crystal with strong color zonation, 6.3 cm in length. A. Watzl Jr. specimen and photo.*

Federico PEZZOTTA
Museo di Storia Naturale,
Milan, Italy
e-mail: fpezzotta@yahoo.com

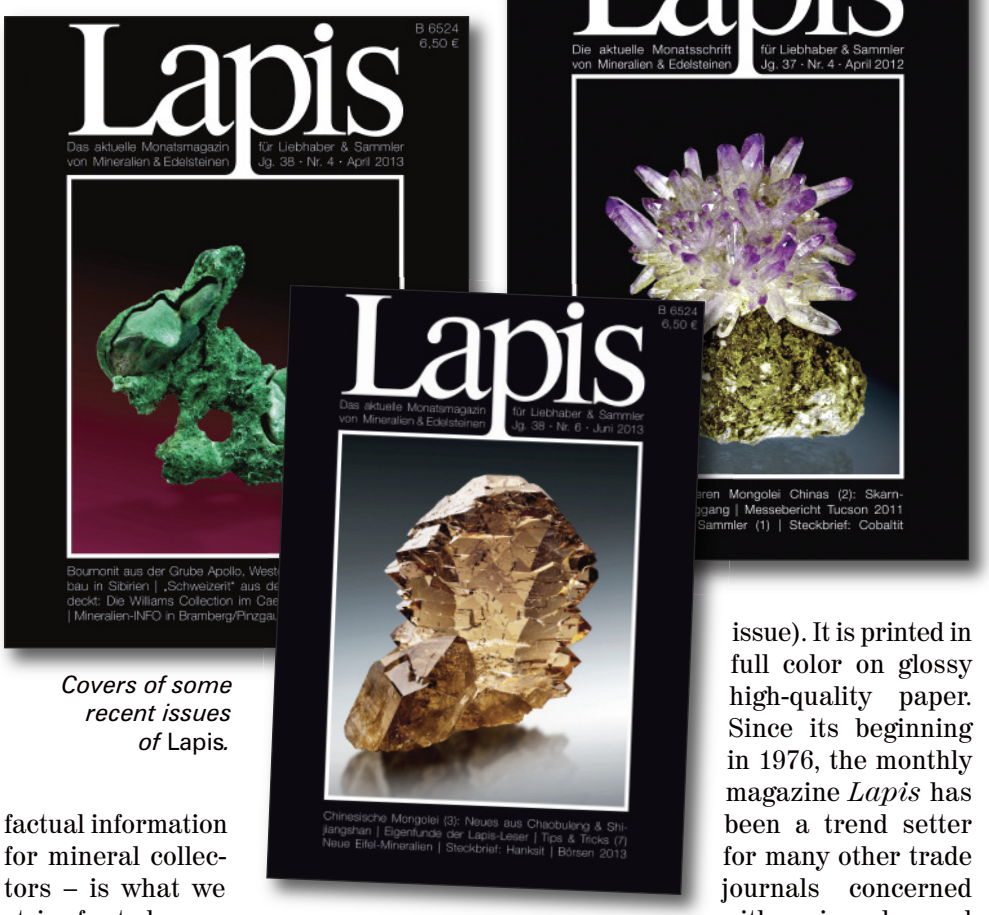
Tomasz PRASZKIER
Spirifer Minerals, Warszawa, Poland
e-mail: tom@spiriferminerals.com

# Journal presentations: Lapis and extraLapis

*Christian (left) and Tobias Weise – publishers and owners of the* Lapis *and extraLapis. M. Hubner photo.*

GOAL

*Lapis* is the only mineral magazine worldwide that is published monthly. The publisher's mission statement in the foreword of the first issue of a "free and independent *Lapis*" – will provide factual information for mineral collectors – is what we strive for today.




*Covers of some recent issues of* Lapis.

*Lapis* is a magazine for mineral enthusiasts, from beginners to professionals to mineral dealers. It provides the entire collector's community with important information about minerals, their localities, mineral shows, how to collect, and much more. On the other hand it is an impressive journal for everyone who is interested in minerals – there is a lot of information, illustrated by top-quality color photos, of very fine mineral specimens.


*Cover of the first issue (1976) of* Lapis *magazine.*

FOCUS AND QUALITY

*Lapis* is issued eleven times per year (in July/August, *Lapis* is a double-issue). It is printed in full color on glossy high-quality paper. Since its beginning in 1976, the monthly magazine *Lapis* has been a trend setter for many other trade journals concerned with minerals and gemstones. Even though it is published in German language, it is one of the most important journals for mineral collectors in the world. Despite the current recession, a community of ca. 9,000 subscribers (two-thirds in Germany and one-third in Europe and more than 40 other countries) makes *Lapis* a very important advertising platform for all mineral dealers and collectors worldwide.

HISTORY

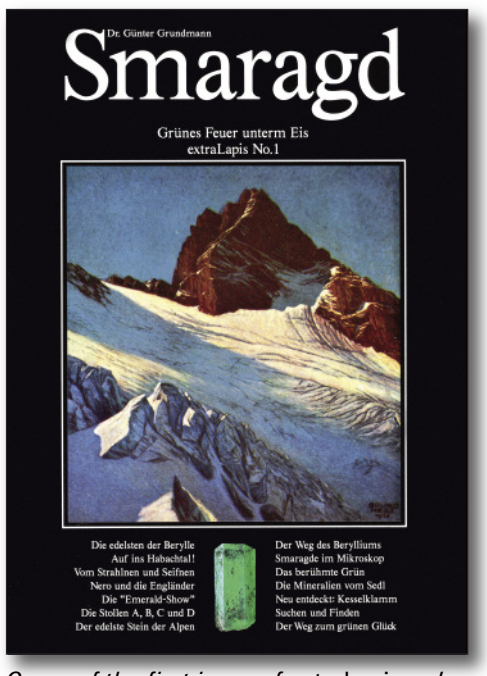
After co-founding the "*Mineralientage*" in Munich, Christian Weise left the team of the show in 1974 to work on the first edition of his field guides on alpine mineral localities. He realized great success with more than 60,000 hardcover books sold. It proved that there was a market for a German mineral magazine.

In November 1976 the first issue of the mineral magazine *Lapis* was published with Christian Weise as publisher, the late Max Glas as editor-in-chief, and notable specialists Eduard Gübelin, Werner Lieber, Hugo Strunz, Hans-Jürgen Wilke, Max Weibel, Carlo Grammaccioli among others, serving as advisors on the editorial board. Rupert Hochleitner took over as editor-in-chief in September 1979. He left that post when he was appointed curator of the *Bayerische Staatssammlung für Mineralogie* (Bavarian State Collection of Mineralogy), and was replaced by Stefan Weiss.

The 1983 acquisition of the *Mineralien Magazin*, published by Kosmos, boosted the number of *Lapis* subscribers to over 15,000, making it the mineral magazine with the highest circulation worldwide.

SPECIAL ISSUES

In 1991, Christian Weise Verlag initiated another publication for the mineral collecting community: *extraLapis*, a high quality monograph series, each issue devoted to a specific mineral or a famous mineral region. The highly acclaimed *extraLapis* soon found imitators in other languages around the world; as of today, 44 issues have been published. In the late 1990s, Günther Neumeier acquired the license for an English edition of *extraLapis* and in 2001 the first edition of *extraLapis* English was released in the US. Besides magazines, Christian Weise Verlag has published an impressive list of books on European and worldwide mineral localities (e.g. *China* and *Indien* by Berthold Ottens, *Mogok Myanmar* by Roland Schlüssel, *Schweden* by Hans-Jürgen Wilke). In 2013 the book *China* was published in Chinese language.




*Cover of the first issue of* extraLapis *published in 1991.*

Christian Weise's son Tobias has been applying his talent to *Lapis* and *extraLapis*. Tobias is determined to carry on his father's legacy.

For almost 40 years, the mineral magazine *Lapis* has had a strong influence in shaping the mineral collecting community in Germany, Europe and worldwide.

INTERNET

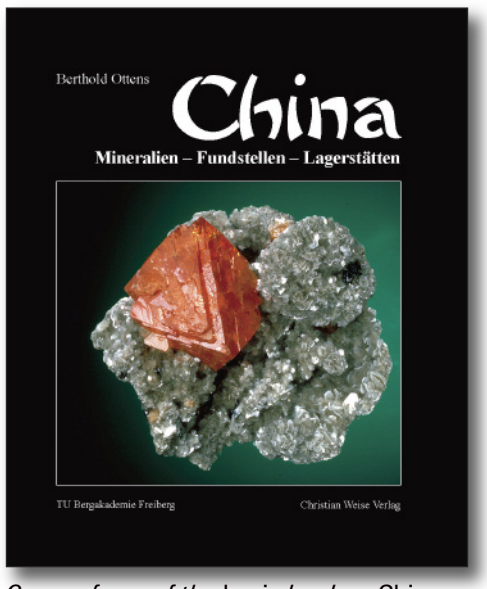
*www.lapis.de* contains a variety of information: up-to-date news, photo galleries (such as the *Lapis* photo contest 2012), show calendar updates, and the very extensive bookshop.

Since 2011 the *Lapis* Facebook page has grown progressively, now attracting more than 5,000 fans.

SUBSCRIPTION

A 1-year subscription for *Lapis* (11 issues) is € 47.00 (plus shipment: Germany € 12.00, outside Germany € 18.00). A 1-year subscription of *extraLapis* (2 issues, shipment included) costs € 32.50 (Germany) and € 35.50 (outside Germany). You can subscribe online at *www.lapis.de* or you can send an email to *lapis@lapis.de*


*Cover of the recent issue of* extraLapis *published in 2013.*




*Cover of one of the* Lapis *books* – China*, published in 2008.*

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Calcite on cavansite, 3 cm, from Wagholi, India. J. Gajowniczek collection. J. Scovil photo.

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