The Fluorescent Mineral Society UV Waves

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WHAT HAS AN ENERGY DENSITY OF 200Wh/kg AND FLIES?

By Mark Cole, #1322, markcole@minershop.com



Over the last 15 years lithium batteries have replaced the old lead-acid clunkers and NiMH battery packs we used to carry around. Lithium-ion batteries are popular because of how much power they can put out at a given size and weight. For example, a typical 1kg lithium battery stores 150 watt-hours of electricity, compared to an equivalent NiMH Battery pack (100 watt-hours per kg) or Lead Acid Battery (25 watt-hours per kg). It takes 6 kilograms to store the same amount of energy in a lead-acid battery that a 1-kilogram lithium-ion battery can handle. Being light, with a much higher energy density, and relatively cheap, they are the battery of choice for our new UV flashlights. But they have a downside – when they catch fire or explode the resulting fire is very hard to extinguish. All types of battery chemistries can cause fires, but lithium is perhaps the most susceptible.

A brief review of the types of batteries we use is probably in order here. But first, an important techy concept needs to be explained: watt hours. Watt hours refer to the capacity of a battery. It is computed by multiplying the battery voltage by the rated battery amperage. A 12 volt battery rated at 5 amps would provide 60 watt hours (60Wh). If your light requires 2 amps at 12 volts (24Wh) the battery will run it for about 2 ½ hours (60÷24).

Lead Acid

Big, heavy, clunkers used in gasoline cars. We all have them. Before 2001 they were the most common battery used in our hobby. The most typical size was 12V, 7A which equaled 84Wh. They weigh around 2.7kg, with an energy density (Wh/kg) of 30.8.

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NiMH

I made my first trip to Greenland in 2001. Knowing I would be doing a lot of mountain, climbing I refused to burden myself with a hunk of lead. I built an NiMH battery pack. NiMH has a much higher density to power ratio – a typical 12V, 4.5A (54Wh) pack would weigh about 0.57kg, with an energy density of 94.7.

I published a DIY article on minershop.com so others could build their own packs. Soon, commercial packs were available and many hobbyists switched to NiMH.

Li-ion

Several types of lithium batteries are available. For this discussion we are talking about Lithium Nickel Manganese Cobalt Oxide (18650 batteries), the type most commonly used in our flashlights and in the battery packs for the latest generation of tube lights. I built lithium packs around 2006 but did not provide DIY instructions due to the inherent dangers if built incorrectly. Sometime around 2008 commercial packs came on the market and became a mainstay for team Greenland's yearly Geo-Tours.

Lithium batteries have an energy density of 150-220 Wh/kg, far higher than NiMH or lead-acid. They power lights far longer and weigh much less than any of the other technologies. I can't imagine anyone using a lead-acid battery (or even NiMH) to power their tube lights today. And our flashlights only work with lithium batteries (with a few low-end exceptions using alkaline "AA" batteries).

So what's the problem?

Having a much higher energy density simply means more power for longer runtimes. It's no wonder that today our hobby lights are driven by lithium. Power tools, laptops, cars, vacuums, phones, toys, scooters, hover boards, are all powered by lithium batteries.

For the most part they are safe when handled properly. But when our batteries fail or overheat, they release flammable, toxic gasses that can spark a fast-spreading fire that is extremely difficult to extinguish.

It's a rare event but we all read about these fires in the news. Electric scooters and electric vehicles burst into flames – just check YouTube for videos.

A failure such as a short circuit, overheating, or damage to the battery case can be cause for disaster. To make things worse, these types of fires are very hard to extinguish.

So how do we prevent forest fires?



I have never heard of a lithium battery overheating and catching fire in my small circle of hobby friends. I think it's a pretty rare event, and usually a result of mishandling, or from a cheap counterfeit battery off eBay. But there are a few simple rules that will help keep you out of trouble:

• **NEVER** check lithium batteries in checked baggage when flying. ALWAYS carry them in your hand carried luggage. Fires started by a lithium battery can be managed by flight personnel in the cabin, but not in the luggage hold.

The FAA and A have published guidelines and regulations covering lithium batteries on a plane -https://www.faa.gov/hazmat/packsafe/lithium-batteries

• **ALWAYS** buy authentic batteries from a reliable seller. I never buy the crap you see on eBay for pennies on the dollar. There are so many fakes, some easy to tell, others not so much.

An 18650 battery has a maximum capacity of 2600mAh to 3600mAh. Those advertising up to 9000mAh (or even more) are fake. There are other types of lithium batteries (26650, 21700, etc.) which have higher capacities but the same problem exists with them – rampant over spec'ing.

It's not the exaggeration that worries me, it's the technology. Lithium batteries have all kinds of safeguards built in to prevent fires. A company that counterfeits, or lies about their battery can be up to all kinds of nefarious things. Only buy from a reputable dealer.

• **Protect** your batteries from damage. A common cause for failure is mechanical damage to the cell. YouTube is filled with videos of folks piercing batteries with a nail – it's spectacular. But even everyday abrasion, bumps and grinds, can damage the battery jacket. Carry spare batteries in the plastic protective case.

• **Monitor** batteries while charging. There are so many chargers on the market it's hard to tell which is well designed and which is garbage (although the price may give you a hint). Chargers have to be smart enough to know when enough is enough. They should have temperature sensors to tell if a battery is getting too hot.

• **Protected vs Unprotected:** Lithium batteries come in both flavors. A protected battery protects against short circuits, limits the discharge and charging rate, as well as the heat. I would always recommend them if your equipment allows it. But protected batteries won't fit in some lights, the protection circuitry makes them a little longer. Some lights, especially our fluorescent tube lights, requires more power that a protected battery can supply. And, there's the problem of the junk batteries – if they're lying about the Wh how do we know if they really have protection.

• **Never** run your battery down to zero – a big no no. Most good flashlights protect against this, as well as protected battery cells.

• **Can** your flashlight be easily turned on while packed in your hand carry? Take the batteries out.
All of my lights have tail switches which require a hefty push to turn on the light, not easy to push side switches. And I still wrap my lights in bubble to protect against accidental turn-ons. Imagine if one of our high power lights accidentally turned on in the overhead compartment and sat there for 2 hours, full blast. The light would get extremely hot, in turn the battery also.

A hot lithium battery is a fire in waiting.

Pro-Tip

You should make sure your batteries are fully charged before heading out. Many single battery flashlights use LEDs that require 3.8V to 4.2V to operate properly. This is called the forward voltage of the LED (Vf).

A lithium battery, by nature, charges to 4.2 volts. They quickly discharge to their operating voltage of 3.7V, and then slowly continue discharge from there to a little under 3.5v where they are unusable.

By having freshly charged batteries you'll be getting the most out of your 365nm LED, driving them at the proper voltage. The original Convoy S2 is a good example, it would dim significantly in the first half hour of usage. This is the whole reason we designed the C8 which uses two batteries thus never discharging below 7V (https://www.naturesrainbows.com/post/fyrfly-convoy-c8-365nm-the-next-generation-convoy). Full voltage is always applied to the LED regardless of battery charge (until they are fully discharged).

My advice for the cheapie flashlights is to carry a few spare fully charged batteries, and only use the light intermittently (saves battery life and reduces heat). There are probably some expensive copycat lights that would benefit from fresh batteries also.



"Oh, the humanity."

PackSafe Batteries, lithium (faa.gov)

Power Banks, rechargeable and non-rechargeable lithium batteries, cell phone batteries, laptop batteries, external batteries, portable rechargers, spare (uninstalled) lithium ion and lithium metal batteries, including power banks and cell phone battery charging cases, must be carried in carry-on baggage only. When a carry-on bag is checked at the gate or at planeside, all spare lithium batteries and power banks must be removed from the bag and kept with the passenger in the aircraft cabin. The battery terminals must be protected from short circuit.

This covers spare lithium metal and spare rechargeable lithium-ion batteries for personal electronics such as cameras, cell phones, laptop computers, tablets, watches, calculators, etc. This also includes external battery chargers (portable rechargers) containing a lithium ion battery. For lithium batteries that are installed in a device (laptop, cell phone, camera, etc.), see the entry for "portable electronic devices, containing batteries".

Size limits: Lithium metal (non-rechargeable) batteries are limited to 2 grams of lithium per battery. Lithium-ion (rechargeable) batteries are limited to a rating of 100-watt hours (Wh) per battery.

These limits allow for nearly all types of lithium batteries used by the average person in their electronic devices.

With airline approval, passengers may also carry up to two spare larger lithium-ion batteries (101–160 Wh) or Lithium metal batteries (2-8 grams). This size covers the larger after-market extended-life laptop computer batteries and some larger batteries used in professional audio/visual equipment.

Quantity limits: None for most batteries — but batteries must be for use by the passenger. Batteries carried for further sale or distribution (vendor samples, etc.) are prohibited.

NOTE: There is a limit of two spare batteries per person for the larger lithium ion batteries described above (101–160 watt hours per battery).

Batteries must be protected from damage.

Battery terminals (usually the ends) must be protected from short circuit (i.e., the terminals must not come in contact with other metal). Methods include: leaving the batteries in their retail packaging, covering battery terminals with tape, using a battery case, using a battery sleeve in a camera bag, or putting them snugly in a plastic bag or protective pouch.

EYE CANDY: THE EDITOR'S PHOTOGRAPHIC INTERLUDE

Last month, while casually surfing the mineralogy exhibit at the Museum of Natural History at the Smithsonian, feeling unfettered by the great unwashed masses competing for front row eligibility to drool on the glass protecting the Hope Diamond, I came upon this breathtaking specimen of phosgenite. I immediately thought of Glenn Waychunas, Simone Conti and Wim Bruines (that's a good thing). Then I snapped a few photos. Apparently, simultaneously someone deployed a Convoy, demonstrating phosgenite's bright, Pb^{2+}-activated fluorescence (LW UV). I can't identify the culprit because there must be dozens of people in that exact spot, at that exact time, who are aware of phosgenite and its fluorescence, and who walk around armed with a LW-emitting flashlight.



Phosgenite $Pb_2CO_3Cl_2$
Monteponi, Sardegna, Italy
Visible Light



Phosgenite $Pb_2CO_3Cl_2$
Monteponi, Sardegna, Italy
LW UV

FMS MIDWEST CHAPTER 2022 ANNUAL MEETING REPORT

By Chris Clemens, Midwest Chapter President, FMS #2011, Crown Point, IN
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After two years of postponement due to the COVID-19 pandemic, the FMS Midwest Chapter successfully resumed its Annual Meeting in 2022. This year's event took place on Saturday, June 4th, and as in past years, was held in Marion, Kentucky. The venue was again the Crittenden County Senior Center, which has served our meetings well due to its location directly across the street from the renowned Ben E. Clement Mineral Museum; its size, which more than adequately accommodates our turnout; and the ability to easily black out the windows to provide essential darkness for our glow rocks. As in previous years, highlights of the 2022 meet-up included an all-day fluorescent mineral swap/sale/show and tell, tours of the Clement Museum and their world-class exhibits of fluorite and fluorescent minerals, a fluorescent mineral raffle, and of course an opportunity to meet and mingle with fluorescent mineral celebrities and collectors from all over. There were a few changes to the meeting this year, mostly good, one not so good. First the good news. In a departure from past years, this year's event was held in the Spring instead of scheduling it in the Fall as has been the tradition for our previous meetings. The reason for this change being this year's event was held in conjunction with the Ben E. Clement Mineral Museum's Spring Rock and Mineral Show, which took place at Fohs Hall, directly across the street from our Senior Center venue. This change served the dual purpose of both providing our members with the added attraction of being able to visit the Clement Museum Show, and to draw visitors from the Museum Show to our event in hopes of generating new interest in fluorescent minerals and perhaps to grow the membership of the FMS. The not so good change this year was that the self-guided field collecting opportunities in Southern Illinois that were open to our members in previous years are no longer advisable due to private property and land access issues. The Annabel Lee Mine is now posted with "No Trespassing" signs and the Minerva #1 Mine is actively patrolled by the Hardin County Sherriff for trespassers. These were previously two very popular collecting sites for our members. On the morning of our event, I arrived early to open the doors to members who volunteered to help set up the facility. Tim Kienzle (Bonner Springs, KS) and April Buettner (Kansas City, KS) were on window black-out duty, with assistance provided by the grandchildren of the museum's Ed Clement. James Kilgore (St. Ann, MO) generously provided 50 pairs of UV safety glasses for any attendees or visitors who needed eye protection. Steve Capps (Mt. Juliet, TN) was on-hand to provide whatever additional assistance was needed. Mark and Valerie Cole (Dowelltown, TN and Windermere, FL), along with Rhett Peterson (Lees Summit, MO), also arrived early to help set things up. I'm probably forgetting to mention the names of other volunteers, and for that I apologize, but thanks to everyone who helped to get the Senior Center ready for the start of our meeting. Your assistance was greatly appreciated. The payback to the volunteers was that they got dibs on the best table locations for the day.



Meeting organizer and FMS Midwest Chapter President Chris Clemens brought an interesting selection of uncommon fluorescent mineral specimens, including many from midwestern locations.

Footnote: All photos were taken by the author, except those marked with *, which were taken by Dennis Michael

The official start of the meeting kicked off right on schedule at 9 AM sharp. The current President of the FMS, Lee McIlvaine, set up a desk just inside the front door to sign-in attendees and to welcome visitors that wandered over from the Clement Museum show.

Lee traveled all the way from the Philadelphia area to take on the responsibility of promoting our fluorescent mineral hobby and the FMS to visitors to our meeting. As has always been the case, our meeting was open to anyone with an interest in fluorescent minerals, regardless of FMS membership status or Chapter affiliation, and there was no charge for entry. By the end of the day, Lee registered more than 65 members and visitors, and did a great job of educating attendees about fluorescent minerals, the FMS, and UV safety. Although Chapter member attendance was down from our last meeting in 2019, we made up for it with visitors from the Clement Museum show across the street, who in many cases were exposed to the fluorescent mineral hobby for the first time. The hope is that these efforts will take seed and generate new interest in our hobby.

Throughout the day, we cycled the room lighting between white light and darkness to give everyone a chance to check out the many spectacular mineral specimens on-hand under visible and UV lighting conditions.



Current FMS President Lee McIlvaine traveled all the way from Philadelphia to join the festivities. I can't thank Lee enough for his efforts during the show. He kept very busy checking-in attendees and guests, and most importantly, promoting the FMS and UV safety!

This made for an action-packed day, filled with fluorescent mineral thrills and excitement, and there were many great rocks to be seen! Some of the highlights included a large assemblage of world-class Greenland minerals and big Challenger Cave TT calcite rhombs brought by MinerShop (aka Mark and Valerie Cole). Fred Speyer and his son Wyatt (Clarksville, TN) brought a wonderful assortment of brightly fluorescent, self-collected Franklin and Sterling Hill rocks.



Team MinerShop: Mark Cole (L) and Valerie Cole (R). Mark travelled from central Tennesse and his daughter Valerie came all the way from Florida to attend this year's meeting.



***Greenland tugtupite/polylithionite specimens under SW UV on the Minershop table.**



An added attraction for this year's meeting was that it was run in conjunction with the Annual Clement Museum Spring Rock and Mineral Show, which took place directly across the street from our meeting. This arrangement benefited both the FMS and the Clement Museum, as each event received crossover visitors from the other's shows.

Rhett Peterson (Lees Summit, KS), of Engenious Designs fame and past FMS President, offered an assortment of his latest, state of the art UV lamps and flashlights for demonstration and sale. Diane Rose and Mike Sullivan (Storden, MN) brought a wonderful variety of fluorescent specimens from various locations.



Mr. Engenious Designs himself, aka Rhett Peterson, shows off some of his latest UV flashlight offerings.



Panorama of the action during one of the lights-out sessions.



Diane Rose and Mike Sullivan brought an impressive variety of fluorescent mineral specimens this year, including some beautiful fluorescent gem trees.

Steve Capps (Mt. Juliet, TN) showed us some interesting fluorescent Tennessee geodes and drill core specimens. Ed Mayercik (Smyrna, TN) had an interesting assemblage of specimens including some nice agrellite, plumbogummite, zincite, and some bright green-fluorescent chalcedony specimens, among others.



***Ed Mayercik's table featured a variety of specimens including Brazilian kyanite, ruby, Rogerley Mine fluorite, agrellite, plumbogummite, chalcedony, and tiffany stone from Utah. Ed set-up an impressive multi-wavelength UV lighting system with LW at left, MW center, and SW on the right.**

Joe Ross from Cincinnati, Ohio brought a variety of UV lamps and an impressive collection of fluorescent specimens to show off. Many other members brought spectacular rocks for show and sale also. Coming from Allen, Texas, Mike Crawford got the award for travelling the farthest to attend the meeting.

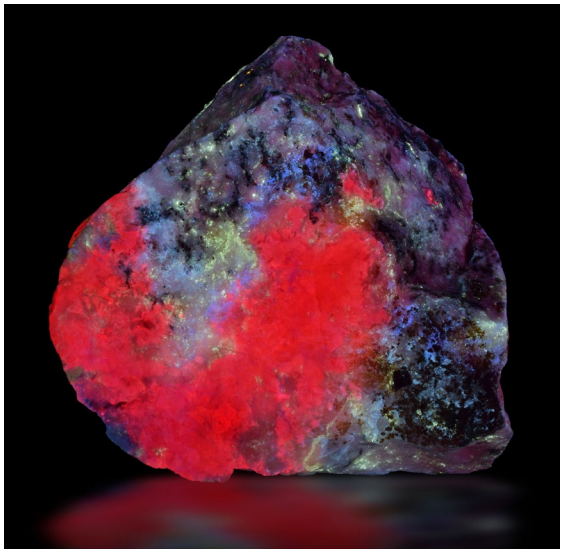
The Clement Museum show across the street was very popular, and featured a wide variety of vendors and high-quality offerings, including some fluorescents and many midwestern mineral specimens.



An old friend of ours, Gary Griffith (L), had a large selection of local fluorite specimens for sale from his Spar Mountain specimen mining operation. Gary was selling at the Clement Museum show.

An added benefit of the two events being held concurrently was that the Museum arranged to have two food trucks on hand, providing fare ranging from hot dogs to gourmet BBQ. As an added bonus, Jill Gentry, of the Clement Museum board, set up a complementary coffee maker and assortment of doughnuts and other snacks for our members and guests in the Senior Center. Nobody went hungry that day!

The meeting ended on an exciting note, with a fluorescent mineral raffle. This year our donors really stepped it up and provided some pretty nifty, high-end prizes. Rhett Peterson/Engenious Designs donated a gaggle of UV flashlights, including both LW and MW UV versions. Mark and Valerie Cole/MinerShop donated an assortment of high-end fluorescent mineral specimens, including a large and brightly fluorescent Canadian wernerite, a big and bright piece of Greenland sodalite, a large bright green fluorescent Mexican opal, and a large and impressive Terlingua-type calcite rhomb from the Challenger Cave in Mexico. The grand prize was offered up by MinerShop and was a world-class, fist-sized specimen of very brightly fluorescent gem tugtupite.



The grand prize raffle tugtupite specimen offered up by MinerShop, shown here under SW UV. This exceptionally bright tug was collected by Mark Cole in 2005 from the Western Taseq Slope of the Ilimaussaq complex, Kujalleq, Greenland. Kristine Clemens was the winner of this exquisite prize.

Due to an abundance of donated prizes, nearly everyone went home with something from the drawing. Although member attendance was down from our 2019 meet-up, this year's extravaganza was enjoyed by all who were able to make it, and we received a record number of non-FMS visitors from the Clement Museum show. Many spectacular rocks were in attendance this year also! The 2022 event provided an opportunity to visit with many friends and some spectacular rocks, and was another great success. I look forward to our next meet-up in 2023.

In Memoriam: Sadly, the 2022 Midwest Chapter Meeting was the last trip that my wife Kristine and I would take together, as 3 months later, Kristine lost her 5-year battle with cancer. I miss Kristine dearly, and would like to posthumously thank her for the tremendous support she gave me over the years in the pursuit of my interest in fluorescent minerals. My life will never be the same without her.



Kristine



Rhett Peterson (L) was in charge of raffle ticket sales for the meeting. Here he places a winning ticket into the box for Mike Crawford (R).



Steve Capps brought an impressive collection of drill cores (including some that are brightly fluorescent) and Tennessee calcite geodes.



Steve Capps (L) chats with Fred Speyer (R) over Fred's display.



L to R: Joe Ross, Diane Rose, and Dennis Michael examine one of Joe's specimens.



April Buettner (R) checks out Fred Speyer's (L) selection of brightly fluorescent specimens. Fred brough an impressive variety of self-collected minerals from locations such as Franklin and Long Lake.



*At the front desk, Lee McIlvaine (R) discusses a specimen with Tim Kienzle (L).



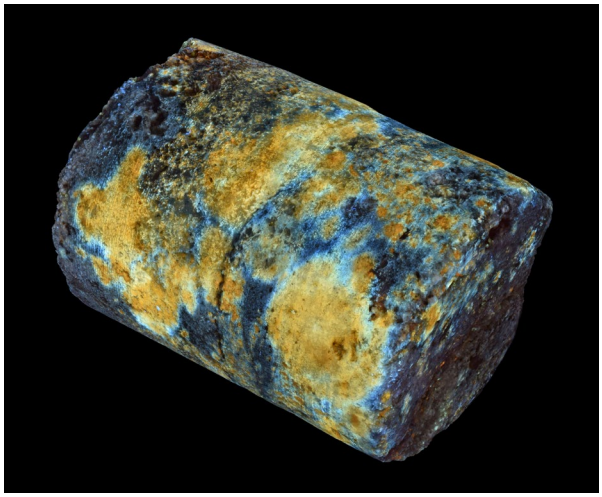
Mark Cole (L) points out a mineral of interest to Tim Kienzle (R) on one of his many spectacular Greenland specimens.



Rhett Peterson (L) and Wyatt Speyer (R) pick another winning raffle ticket. This year, Engenious Designs and Minershop donated some fantastic raffle prizes, including UV flashlights and high-end fluorescent mineral specimens.



Joe Ross (L) checks out the many beautiful fluorescent specimens brought by Diane Rose (R).



One of the many fluorescent drill core specimens brought by Steve Capps, shown here under full wave UV (SW+MW+LW). This core was obtained by Steve as part of a project west of Nashville, TN.



*Mark Cole brought an impressive armada of custom-built UV flashlights. Nice case too!



*The Minershop table, set up by the father/daughter team of Mark and Valerie Cole, offered far more tugtupite than one generally sees in one place.

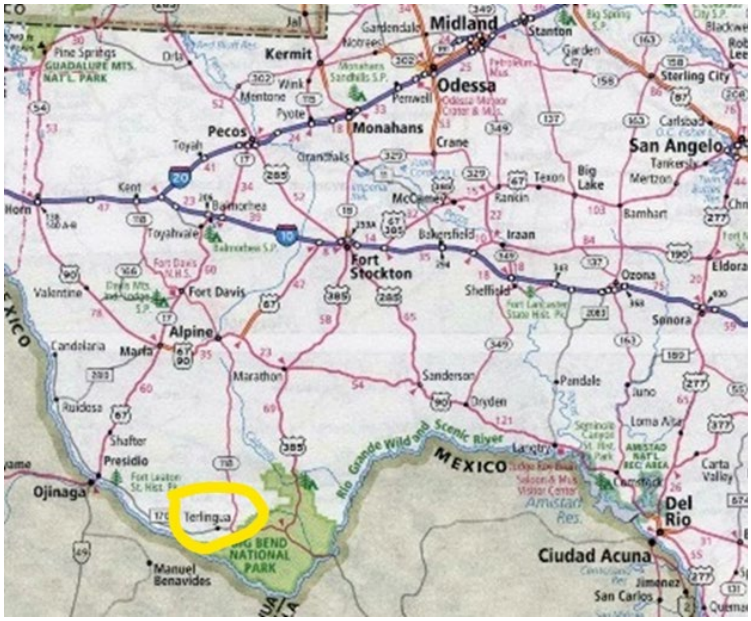


*More material on the Minershop table. Here we see Terlingua-type Calcite from the Challenger Cave, Afghanistan combinations with phlogopite, Malawi zircons, and Mexican opal, under SW UV.

FMS TRIP REPORT - TERLINGUA, TEXAS

By Bart Pickard, FMS #2275
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Terlingua, Texas is a small town, population 78 according to the 2020 census. It's located in Brewster County, in south-west Texas, just outside and northwest of Big Bend National Park.



Population estimates are subject to debate, however, ranging as high as 500-600 for the Study Butte-Terlingua area. In its early history, Terlingua was best known as a mining town for mercury, or quicksilver. From 1888 to 1973, the area's mines produced more than 5,000 tons of mercury. The price of mercury dropped steadily during the 1930's, ultimately bankrupting the Chisos Mining Company (the primary employer in the area), resulting in such a significant loss of population that Terlingua became a ghost town. The current human cost of mercury mining continues to this day. https://www.youtube.com/watch?v=y8kEM-RKaek. More recently, Terlingua has become known as a tourist destination due to its proximity to Big Bend National Park, and for its National Chili Cook-Off events, which draw thousands of people annually. https://www.casichili.net/terlingua-519350.html#:~:text=%E2%80%8BEach%20year%20on%20the,7%20miles%20East%20of%20Lajitas.

Of interest to fluorescent mineral collectors, however, is the classic fluorescent mineral known as Terlingua calcite. What makes it a classic is that, 1) the fluorescence is bright, 2) it fluoresces different colors under different wavelengths of ultraviolet (UV) light: pink under long wave (LW) UV, lilac under mid-wave (MW), and blue under short wave (SW), and 3) it has long-lasting phosphorescence, or afterglow, after exposure to both MW and SW UV. With these features, it can hold its own in any display of fluorescent minerals. Calcite from other locations that fluoresces similarly to Terlingua calcite is known as "Terlingua-type," or "Tt-calcite." By definition, actual Terlingua calcite comes from only one location-Terlingua, Texas. This article covers my trip there, and all the fun I had!



Thirteen-pound chunk of Terlingua calcite *in situ*, showing daylight pink color.

After planning for many months, I set out on Saturday, October 1, 2022, with my vehicle loaded with a little gear, and lots of boxes: big, small, flat, sturdy, etc. The boxes previously held cherries, and were acquired from the grocery store where I toil at my day job. Since my customary clock-in time is 5:00 a.m., it was no trouble for me to be on the road at 5:45. This let me sleep-in a little, and gave me more than enough time for an extra cup of coffee before the 600-mile, 9-hour drive ahead of me. I reached Terlingua, and checked into the Chisos Mining Company Motel, a sprawling complex with a couple of buildings with lines of rooms, as well as

multiple individual cabins, and some other structures that looked like they might be rooms, but were mysteriously padlocked. My room was the very last room in the very back of the complex. It had dark wood paneling and sparse furnishing: a bed, two nightstands with lamps, and a bathroom. No phone, no TV. The motel was mostly vacant, and being at the very back with no one else around gave it a somewhat creepy, Bates-like vibe. But since I didn't plan to spend much time there, it didn't matter. The vibe actually enhanced the experience!



My little motel room

After checking in, I called my friend and local resident, Fred Gossien, to let him know that I had arrived. And while it's a Terlingua post-office address, Fred's place is many miles beyond Terlingua and out into the Chihuahuan Desert, along some rough unmarked roads with several different unmarked forks. Even though I've been there before, at least once I always seem to take the wrong route and get turned around. This time it took more than one attempt before I finally found my way and arrived at Fred's. Why didn't I use my cell phone for directions? I tried, but out in the desert the cell service is spotty or non-existent.

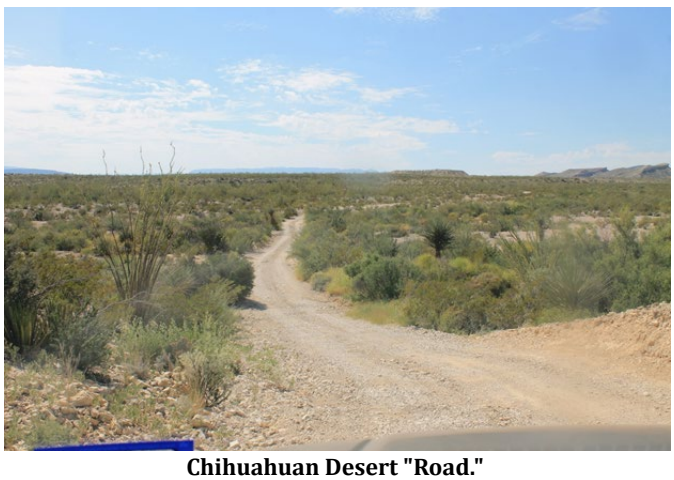
Fred and his Terlingua Calcite and Cinnabar Company was a long-time Sustaining Member of the Fluorescent Mineral Society. Fluorescent mineral collectors owe him a huge debt of gratitude. He was the one who, after years of searching, finally located the acknowledged source of Terlingua calcite, The Little 38 Mine. With permission, he salvaged more than a significant quantity before the mine was reclaimed.

Fortunately, Fred recorded his story in two articles in the UV Waves, v34 n3, and v35 n4. (https://uvminerals.org/publications/uv-waves/ for FMS members.) For many years, he sold his finds online (terlinguacalcite.com), but has now retired from that activity, no longer having an interest in people contacting him. Fortunately, he has graciously allowed me to assume a degree of stewardship over that aspect.

Upon arriving at Fred's, I saw Terlingua calcite in piles, rows, and seemingly everywhere I looked. Looks can be deceiving though, as Fred's rock yard consists of not only Terlingua calcite, but countless other types and varieties of rocks and minerals he's collected over the years from around the local area, and across the country. While the Terlingua Mining District has a rich history of mercury mining, the area also has numerous other mineral occurrences that are of interest to collectors: calcite, fluorite, barite, chalcedony, agate, iron balls similar to Moqui marbles, and many more.



Fred's Terlingua calcite among the prickly pear, mesquite, creosote, and candelillas.



Chihuahuan Desert "Road."



Graveyard In The Terlingua "Ghost Town"



Terlingua "marbles."

I started my visit with a daytime tour of Fred's yard. With rocks everywhere, and of various sizes, types, and "looks," my eyes were drawn this way and that. At every turn, there was always something new and different to see and ogle. For a rockhound, it was like heaven. Bending to pick up a cool piece here and there was the lead-in to the selection of the pieces that were the objective of the trip: Terlingua calcite. But that would have to wait a little longer until later in the evening, when it started to get dark. After touring Fred's yard for an hour or so, it was time for dinner. We went to The Chili Pepper Café in Terlingua (I forgot to look up how many Michelin Guide stars) and got our meals to-go. We took our order to Fred's friend's home and had some good food and great conversation. After dinner, I was treated to the labyrinth that Fred's friend had created on her property. It's a beautiful piece of artwork with circular paths made of shells, fossils, rocks and minerals that she had collected over the years.

I could have spent hours looking at all the interesting specimens that made up the paths. But my mind was elsewhere, and I wanted to see some of the other sights. Fred graciously took me on a mini-tour of the area, including the Ghost Town, and of particular interest, The Little 38 Mine. While the road was open, The Little 38 was posted, so we didn't spend much time there. We stayed just long enough for him to show me the area and for me to get a few pictures.



Labyrinth



The last remains of the Little 38 Mine Tailings Piles

We returned to Fred's before dusk. The main attraction was the Terlingua calcite that was scattered throughout the property. A pile here, a line there, a grouping over there, seemingly endless pieces everywhere! Most of the material was collected in the early 2000's, with the permission of the mine owner. Much of it has been sitting out in the heat and sun of the Chihuahuan Desert since then, and as a result the exposed surfaces of the rocks mostly show faded LW responses. Regardless, the sheer number of specimens just lying around was amazing!

Of course, I focused on collecting the brightest specimens.

On this first night, I revisited the areas from my first trip three years earlier. Like a kid in a candy store, I went from pile to pile, line to line, group to group, and gathered a nice little pile to be weighed and boxed up a few days later, closer to the end of the trip. And while collecting the Terlingua calcite, it was impossible to not get distracted by some of the other fluorescent minerals in Fred's yard.

As a fluorescent mineral enthusiast, I asked and since Fred was willing, I was able to acquire some of those other mineral specimens as well. After a long day, it was time to call it a night. But before leaving, we planned the next day's activity: collecting at Needle Peak, a nearby location owned by one of Fred's friends, where one can find petrified wood and fluorescent chalcedony.

Fred is quite familiar with the Needle Peak area, having explored it extensively, including one 9-hour day when the temperature was 115-degrees! Fortunately, he had come equipped with two gallons of water and weak tea (over 16 pounds!) that he consumed over the course of the day.

It seemed like we drove for an hour over a road/track/trail that was sometimes barely visible. I'm glad Fred knew where he was going! Some areas were quite rough, some quite steep, and some quite loose. Fortunately, my trusty 4Runner handled it all with ease. And even though it seemed like a long drive, the company, conversation, and beautiful scenery made the time go by quickly.

We dropped into a dry creek bed, followed its path for several hundred yards, then parked. We scrambled up the other side of the creek bed to a plateau littered with rocks. Within minutes, I found my first piece of chalcedony, showed it to Fred and put it in my pocket. Much later, after returning to my little motel room, I found that it was one of the brightest pieces of fluorescent material that I found out there. Back at the Needle Peak area, we both started hunting around, heads down, on the lookout for nice pieces. After a couple of hours hunting around, I had found a few pounds of decent chalcedony and petrified wood, much of it fluorescent green SW and/or orange LW.

Fast-forward to 7:00 p.m., back at Fred's. It was still mostly daylight, but when it began to get dark the collecting began in earnest. This night was for collecting, weighing, and boxing up the specimens that would be coming home with me. By the end of the night, I had collected hundreds of pounds of rocks, but we had only just passed the halfway point of the total which I had planned to obtain. We called it a night, and the next day we decided to get an earlier start and do some daylight collecting. We also decided to pick some larger size rocks so the job would go a little faster and we could reach our target a little sooner. At this point, Fred also allowed me to access some of his better-quality material. Even in bright daylight, it was easy to see that they were great rocks, so it was easy collecting. And while I'm fairly certain that I checked most of the rocks we gathered, there were a few that I apparently chose for some reason because as fluorescent specimens they seemed to be clunkers. These few were definitely in the minority, but thankfully, they all have at least one redeeming quality or another. The day passed and by late afternoon, and we decided to get another take-out meal from The Chili Pepper Café and have dinner again with Fred's friend (article continued on page 15).



Editor's note:

Both racing fans and the general public of a given generation experienced a wonderful reminder recently; the 50th anniversary of otherworldly performance of the otherworldly thoroughbred, Secretariat, completing his Triple Crown by demolishing the competition in the Belmont Stakes.

After his death decades later, it was discovered that Secretariat had a genetic mutation dubbed the X-factor. In addition to his ideal temperament and perfect runner's anatomy (Big Red was handsome too), Secretariat's heart was estimated to weigh more than double that of unaffected horses. This enabled him to overcome the high-output cardiac failure that plagues the other horses during a race. In other words, he was a quality heart-lung machine on legs.

Although unknown in his (racing and breeding) lifetime, only Secretariat's daughters inherited this mutation, the X-factor, coincidentally linked to the X-chromosome. And the probability was that only half of his grandsons would have the mutation. As it happens, one grandson, Storm Cat, and one daughter, Terlingua, did (she was both a racer and a broodmare). Please click this link, which explains the situation better than I can: https://www.youtube.com/watch?v=sBjOwUc-Ho4.

So celebrate Secretariat's Girl, Terlingua (luminescence properties unknown). Just keep it quiet that she wasn't named for Terlingua calcite, Terlingua was known as, "a great filly and a great chili."



Needle Peak Area creek bed.

After dinner, we returned to finish the job. By this time, since Fred was allowing me to collect some of his higher quality material, I was collecting nearly everything in sight, as it was all nice, colorful material. Big rocks and small rocks, it was a no-brainer. It was all pretty! Just load them into the bucket, weigh 'em, box 'em, and repeat!

Seeing all those pretty rocks end up in my boxes was putting me on cloud nine! (Editor's note- historically cloud nine refers to cumulonimbus, rising to 10 km altitude.)

Regardless of my excitement, it was still a lot of work, and by about 9:00 p.m., I was almost too tired to do much more. There was still work left to do, but I was done collecting. We tallied up the many buckets and the several price points to come to the total. It was a few dollars over a round number so it was easy (and a pleasure!) to settle up, after which I loaded the last of the boxes into the truck. We shook hands, I thanked him for the wonderful experience, and he said the same. We said our goodbyes and I returned to my little motel room for the last night. I was exhausted, but happy.

I surveyed my haul under both LW and SW. I was amazed at my good fortune. Once again, after getting cleaned up, I had no trouble falling asleep.

I woke up early as usual the next day. I had a leisurely pot of coffee, some cereal, and some Hostess Donettes. I loaded my stuff from the room back into the truck, turned in my room key, and hit the road.



Part of the haul.

It was still dark when I left, but the sun started to come up within the hour. As the sun rose, I stopped for a picture to capture the sunrise. A beautiful image and a hopeful sign for a beautiful day. The rest of the trip home was uneventful. Except for that State Trooper in Midland who claimed that I was speeding. Well, I guess it's possible that I might have been, but I didn't think so. He looked through the window, saw all the boxes of rocks and asked me where I'd been and what my truck was loaded with. I told him that I had been rock collecting in Terlingua and that I had found lots of special rocks. "What's special about them?" he inquired. I said, "They glow under ultraviolet light." I offered to show him with my lights packed in the back, but he declined. But I remembered that I had my trusty Convoy S2+ handy in the front seat. Looking back, it's a good thing I didn't get shot. I shined it on a big piece that was within reach and showed him. He said, "That's cool. I've been looking for a good place to go rock hunting. It must be pretty good down there. I'm just going to give you a warning this time, so please drive safely the rest of your way home." I smiled and said, "Thank you, Officer." He went back to his cruiser and pulled away. I laughed! More good fortune! How could I not laugh at what had just happened! As I said earlier, the rest of the trip home was uneventful. Good music made the time fly. I got home in enough time to start unloading before dinner.

There was no Chili Pepper Café franchise at home, so I was forced to cook for myself.

After dinner, I finished unloading everything into the garage. I closed the garage door, turned out the light, and started sorting under LW. The best pieces jump out with their saturated color. Move those to boxes on one side. Check the pieces that look dark. Turn them over to find the amazing colors. Move the best to the boxes on one side.

Start sorting by size: sixty to a box, forty to a box, twenty to a box, ten to a box, six to a box, down to two big ones to a box.



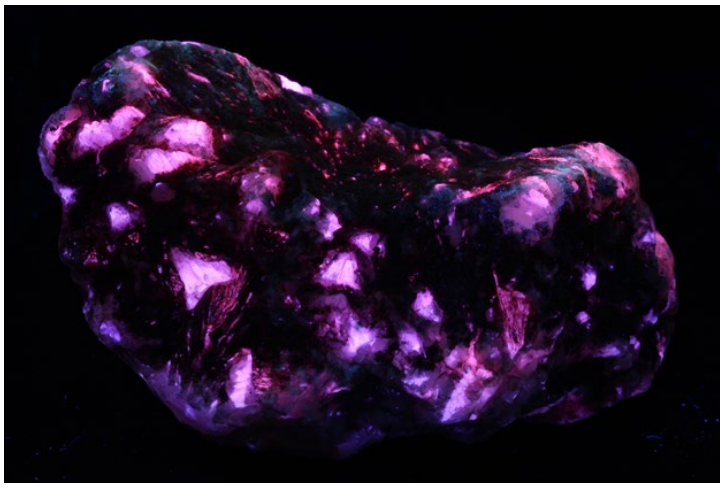
Departing Terlingua at sunrise

The next day's job was to start cleaning. Lift and carry the first box of rocks into the back yard. Fill the bottom of a bucket with rocks and spray them off with a hose. Put them into the next bucket with soapy water, give them a quick scrub with a brush and into the next bucket of clean water to rinse off the dirt and soap. Find a nice piece and check it individually. Let them dry off and put them back into boxes. Carry them back into the garage.

"Wash, rinse, repeat." More bending, stooping, lifting, carrying, sorting. Strenuous work, but what a blast!

After it was all done, most of my garage floor was covered with boxes of Terlingua calcite. Eventually, I ended up stacking the boxes. But even stacked, they still take up a significant amount of space. Fortunately, the size of the stacks and their footprint should decrease as I share them with others who want to own a specimen or two of this fluorescent mineral classic.







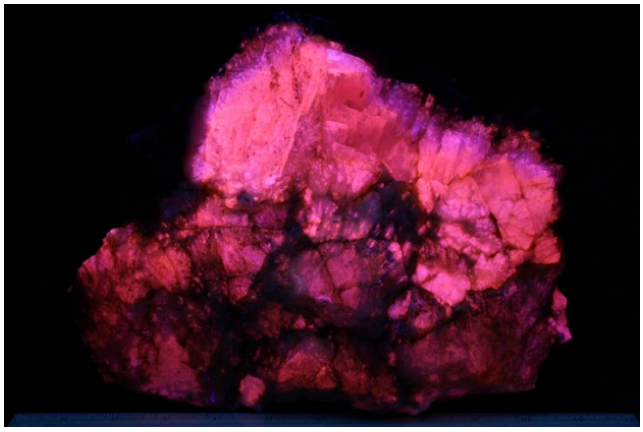


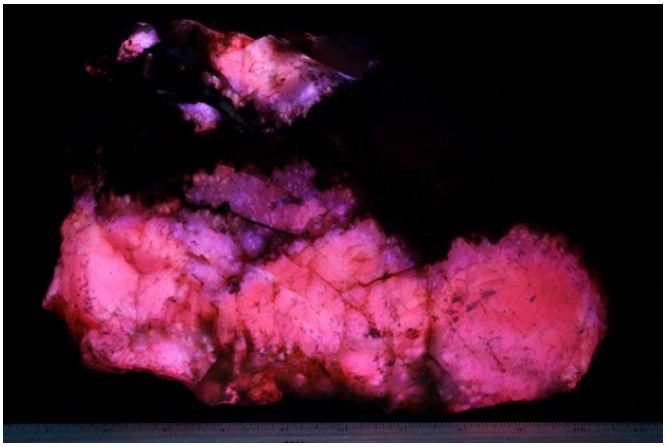
Images to right: Calcite, var. Terlingua calcite. The Little 38 Mine, Terlingua, Texas. Note how the specimens are enhanced by properly cleaning them.

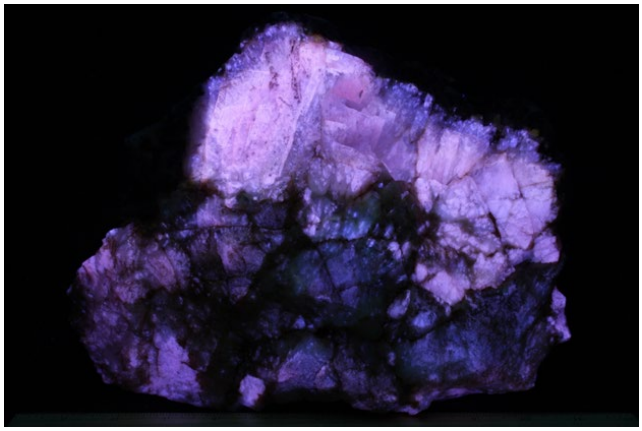
Before cleaning- white light, LW UV
After cleaning- white light, LW UV

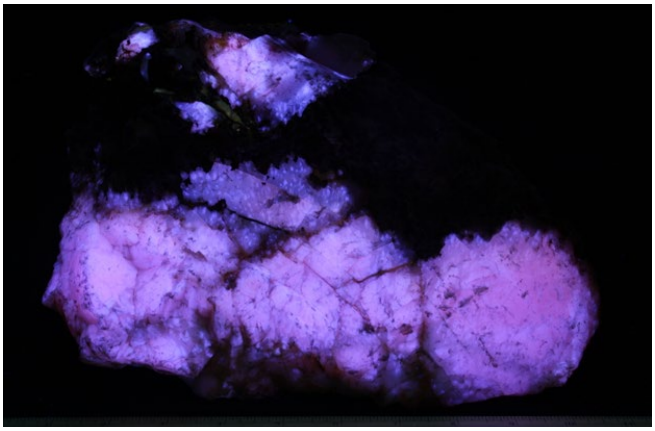


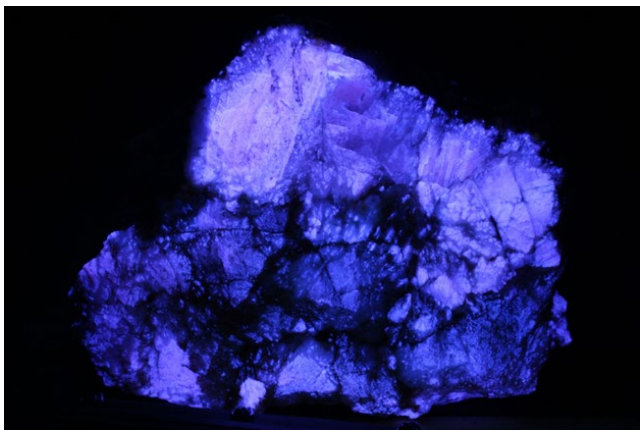


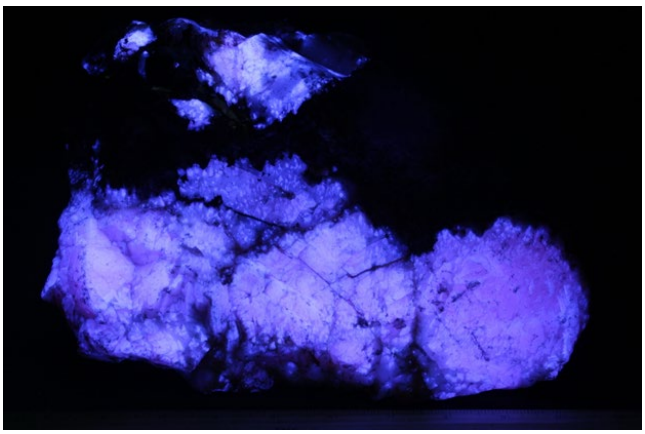












Calcite, var. Terlingua calcite.
The Little 38 Mine, Terlingua, Texas.
10 inches across, 13 pounds.
White light, long wave (red), mid-wave (purple).
short wave (blue),

Calcite, var. Terlingua calcite.
The Little 38 Mine, Terlingua, Texas.
10 inches across, 13 pounds.
White light, long wave (red). mid-wave (purple),
short wave (blue),






Calcite, var. Terlingua calcite, with associated yellow fluorescing calcite.
The Little 38 Mine, Terlingua, Texas. Palm-Sized.

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Robbins MA. 1992. The mercury mines of Terlingua, Texas- Blue fluorescing calcite, part 2. Rocks and Minerals, 67:188-192. *Another great piece of info; the phosphorescence of Terlingua calcite has been detected 18 years after exposure to SW UV. -editor*

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SHINING A LIGHT ON TERLINGUA CALCITE

By Manuel Robbins, FMS #320

I have written about the fluorescent calcite of Terlingua in my book Fluorescence: Gems and Minerals Under Ultraviolet Light (Robbins 1994). I am satisfied with what I wrote there, but there is more to tell; about the locality, and the effort to find the cause of the remarkable fluorescence. I will write of that here. Then I will shift emphasis to the daylight color of this mineral and before I am done, I will invite you to come with me—in spirit—to a New Jersey beach on a hot day for a swim in the ocean.

Most readers know of the marvelous fluorescence of what is called Terlingua calcite. Under short wave it is bright sky blue followed by a long-lasting phosphorescence, while under long wave it is pink or orange-pink. Usually, this mineral shows some trace of color in daylight. This calcite has been known for many years, and for many years there have been at least some attempts to find the cause of this fluorescence.

Terlingua is a place near the Rio Grande in Texas, where there were mercury mines and mercury extraction furnaces. During earlier wars, the mines were particularly active, as mercury was needed for detonators in artillery shells. In addition, prospectors in the West needed mercury as part of the "patio process" for extracting gold, and hatmakers used poisonous mercury in making felt hats (thus the "Mad Hatter" of Alice in Wonderland).

At Terlingua, there were a number of mine dumps. In these dumps there was calcite among other rocks. Not all of this calcite fluoresced as described above. Much of this calcite was not fluorescent at all, or fluoresced yellowish, portraying a complex geology of the mine zone. In fact, the luminescing calcite of interest here occurred at only one of the dumps. At night, when an ultraviolet light was held close to the rocks of that dump, the first things seen were fluorescent scorpions, who held their pincers up defiantly to the ultraviolet light hovering above them. When the scorpions were chased off, rocks fluorescing blue then pink were evident as the light was switched between short wave and long wave.

At that early time, I had surmised that mercury was an activator of fluorescence in the Terlingua calcite. The calcite at the other dumps of the district, however, did not fluoresce in the expected way, a fact that worked against that idea. So did the fact that, as later known, calcite with identical fluorescence is found in many places, places not known for mercury. Such material is referred to as Terlingua-type calcite.

Most beautiful examples of such calcite are fluorescent rhombs of so-called "Iceland spar" from a certain Mexican locality that is called by various names, possibly all of which are correct. These have all the fluorescent properties of Terlingua calcite in a far neater form. Studies done of fluorescence in Terlingua-type calcite are now based almost entirely on such calcite from Mexico.

One exception is a study carried out by Pete Modreski and Don Newsome. They used Terlingua-type calcite from Hope, Indiana. Their plots of the spectrum produced by short and long wave ultraviolet in this calcite are very useful. I believe that much can be learned from these plots, and I urge you to open the pages of my book, already mentioned, to these figures. In the first, Figure 7.1, that calcite under short wave shows a broad peak in the blue. That it is broad indicates that it will be seen as a significantly whitened blue, perhaps like a sky blue. In Figure 7.2, the same calcite under long wave, shows the same peak as in the previous figure, but a broad response centered in the orange region of the spectrum has been added.

It is a safe guess that if the spectrum under long wave was plotted from specimens from different Terlingua-type calcite sources, the height of orange peak compared to the blue peak would differ. That would explain why the color under long wave seems to vary among different specimens: pink, orange-pink, or even a pink-violet. (With a slide projector and a slide that I had fashioned, I had demonstrated to a gathering in Tucson that a combination of blue light and orange light produces pink.)

One can conclude that Terlingua-type calcites contain two types of fluorescent sites, and probably always contains both types of sites together, but

in different ratios. This means that the sites are fundamentally linked, as might be true, for example, of two different ionization states of one activator.

What is the nature of that site? More investigation was required. The presence of activators in a luminescent mineral is usually taken for granted. If mercury is not the activator, what is? Searching for an answer, and assuming that the activator would easily be identified, I took a specimen of Terlingua-type calcite to Neal Yocum at Sarnoff Laboratory in Princeton, N.J. Dr. Yocum holds many patents for the invention of luminescent phosphors for picture tubes. Neal did an electron probe analysis of the calcite specimen. He detected no foreign element of a kind or concentration that would suggest that it might be a fluorescence activator. That result was puzzling to me. I and others had wondered if europium might be the activator, or one of the activators, in Terlingua-type calcite, since it activates blue fluorescence in fluorite and possibly red in certain other minerals.

One way to confirm a suspected activator is by making a synthetic version of the host mineral (often possible) using ultrapure materials and incorporating an ultrapure trace of the suspected activator. With this in mind, I contacted Professor Nick Pingitore, a geochemist at the University of Texas at El Paso. I asked if he would attempt a synthesis of the calcite (calcium carbonate) with europium. With the necessary pure materials in hand, he made several attempts at forming calcite with incorporated traces of europium. All attempts failed. He found that calcite would not form, but rather one of the polymorphs of calcite, aragonite or vaterite. Possibly the presence of europium drove the synthesis that way.

It was now the time to visit William White, a professor of geochemistry at Penn State University, and I made the long drive. We reviewed the problem. He had very suitable equipment and proposed a systematic approach. I left the calcite specimen from Mexico—the only one I owned at that time—with him.

Professor White's equipment allowed him to plot the light emitted not only in the visible region of the spectrum but in any wavelength from visible all the way into short wave ultraviolet. Furthermore, he was able to excite fluorescence not only by what we call short wave and long wave but by any wavelength, from visible to far ultraviolet.

In due time, I received his report (White 1993). With the calcite that I provided, using short wave, he recorded the luminescent spectrum. He repeated this with long wave. In general, he obtained results much like the spectra described earlier, except that his equipment showed that the blue peak was a composite of two peaks. Then, using ultraviolet excitation from 320 to 340 nm, White detected something new: a green fluorescence. Was this green fluorescence a response of this one specimen of Terlingua-type calcite that I had loaned to Professor White? Or was it a general property of Terlinua-type calcite? This can only be answered by an examination of other specimens.

Intrigued by what he had already seen, White was interested in probing deeper into the fluorescence of this calcite and asked if he could keep the specimen. I was reluctant to leave what was then my only such specimen, a decision which in hindsight I deeply regret.

There followed elsewhere a major research investigation of such fluorescent calcite by a large team of researchers, one of whom was Glenn Waychunas (Gaft et al. 2008). Dr. Waychunas, FMS #665 is a scientist with special knowledge and competence in the matter. The target of his work was calcite from many localities, recognized by a daylight pink color.

Many parameters of these specimens were measured and recorded. Perhaps the most informative single result came from a measurement of the concentration of possible activators. The concentrations were too low or no different from that found in nonfluorescent calcite. With that measurement, the activator theory of fluorescence in Terlingua-type calcite collapsed.

The earlier result by Neal Yocum at Sarnoff Laboratory was vindicated. Europium or other REE was out, and so was any other activator. What does that leave? Our understanding of fluorescence in minerals—with the exception of a few self-activated minerals—assumes the presence of an activator.

A new understanding was needed and supplied: radiation-induced F-centers. One thinks of F-centers that cause visible color in halides. But in halides, the concept of an F-center needs to explain so

little. In the case of fluorescence in Terlingua-type calcite, it is asked to explain so much.

Now, about visible color in Terlinqua-type calcite. In the calcite found at the mercury mines at Terlingua, visible color, that is, daylight color, was often evident in a specimen. Most often the color was pink and rarely green. The green color was reserved for that part of a specimen which was buried in the rock dump and thus shielded from the sun for many decades, while the pink was in the exposed part of a specimen. Either way, fluorescence occurred preferentially in the colored part of the specimen. Terlingua-type calcite from Mexico also frequently shows this relationship of fluorescence and visible color.

Is visible color a universal property of Terlingua-type calcite? I have accumulated many rhombs of such calcite of Mexican origin that are completely colorless but fluoresce marvelously in the Terlingua manner. Thus, color need not be expressed, but the underlying mechanism for color must be there.

On the assumption that fluorescence and visible color are in some way linked, is it possible that progress in understanding the fluorescence of Terlingua-type calcite could have been made if the cause of that visible color had been investigated first, and its cause established?

I need to shift focus to Tucson. One year at the Tucson Gem and Mineral Show, I was working my way among the many dealers that set up outside along the Route I-10 access road. Daylight did not impede looking among them for fluorescent minerals. I carry a small portable UV light, and I had an opaque shroud. I came to a table with several flats filled with calcite rhomb cleavages from Mexico, offered for their beauty. They were an inch or two in size. Price: two dollars each. I noticed that they were slightly pink in color, and I recalled the slight coloration of the calcite I had first seen at Terlingua. I asked the dealer if I could examine the contents of a flat under my light-excluding shroud. The specimens fluoresced wonderfully, and I bought a few. I also invited the dealer to put his head under the shroud and see the material by ultraviolet light.

I told friends about this find. When they looked up this dealer later in the day, they found that he had put up a sign: "Fluorescent Calcite, Three Dollars." By the next morning, it was four dollars.

A few years later, again during the time of the Tucson show, I was in a mineral dealer's room looking at the specimens. On the top of a glass case was something striking, a large green calcite rhomb. The possibility was immediately evident. A check with my ultraviolet light showed that it was a Terlingua-type calcite. It fluoresced in the expected way, but it was colored green, not pink. Because of size and daylight color, this was an extraordinary find. The dealer had it displayed under an overhanging lamp, a definite risk to "greenness." I have that 10 x 7.5 cm rhomb now and am writing about it here.

A plan began to form. This specimen had natural cleavage planes. That is how the dealers, or the miners, created saleable specimens out of a larger mass. Could I successfully cleave this specimen without wrecking it? The miners could afford to risk some material, but I could not. Emulating a diamond "cutter" of old as I imagined, I picked a possible plane a short distance from the right side. I carefully placed a chisel along the top and gave it a bang. To my amazement and relief, a section came off neatly. It was not quite along a cleavage plane, but good enough. I could fit the cleaved piece back to the main piece nicely.

It was a hot summer day. Beach weather. My car was always packed and ready for the beach. I wrapped the cleaved-off segment of calcite in lightproof foil, and off we went. The beach was hot. I threw down my beach blanket and beach pack and quickly readied for a swim. I unwrapped the green calcite segment and placed it on the blanket and dashed down to the water. When I returned to the blanket, the calcite segment that was green when I put it on the blanket was colored a vivid orange-pink. I had been gone no more than 20 minutes.

Back home, the orange-pink calcite segment fit nicely still against the green segment, a reward for my effort.

I no longer have my fluorescent mineral collection. It is at Yale University. But I have that green-orange rhomb of Terlingua-type calcite still.

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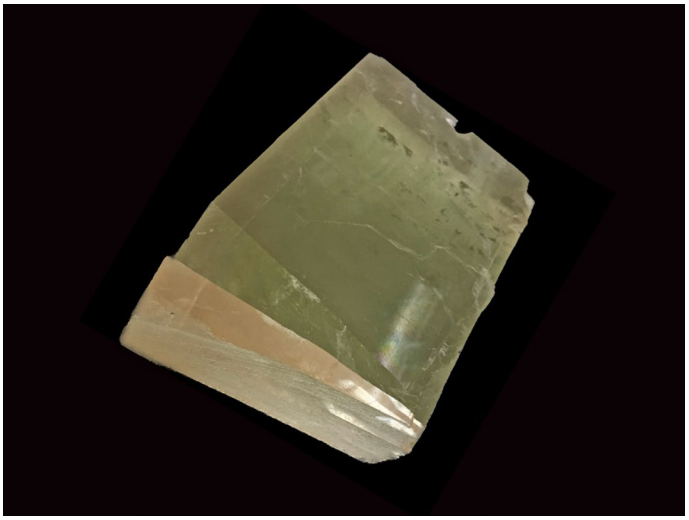
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Terlingua-type calcite, with light-exposed segment cleaved from the specimen. Photos by the author, prepared for publication by Chris Clemens



The light-exposed segment refitted to the original specimen.

POLMAN MINERALS TRIBUTE TO AL LIEBETRAU

It is with great sadness I report that my good friend and fellow fluorescent mineral collector Al Liebetrau passed away on Friday, April 28, 2023. I have known Al for more than 30 years. In that time, he proved to be one of the nicest and most dedicated people I have ever met. He was a giant in the mineral community, both white light and ultraviolet light. Anyone who knew Al always saw a small notebook with him when he attended mineral shows. He always took meticulous notes on specimens, dealers, locations etc. Many times, he would call me and ask if I knew more information about a certain mineral or locality. I'm sure his mineral catalog was as accurate as one could be.

For several years Al was the President of the Fluorescent Mineral Society and did a great job in that position. With that in mind, there was only one person who could have taken on the monumental task of putting together the FMS's 50th anniversary exhibit at the Tucson Gem and Mineral Show in 2022. Al dedicated about 3 years to this arduous task. Needless to say, the exhibit was a success, in spite of all the problems encountered along the way. It is my understanding that even a week before Al passed away, while in hospice care, he was still talking about fluorescent minerals with those who visited him. Now that is someone who was truly passionate about his hobby.

Al is survived by his wife Sue. The two were a match made in heaven as she was as dedicated a mineral collector as Al was.

Not only will Sue miss her late husband, but Al will be missed by many in the mineral community. Truly a great loss for all those who knew him. My deepest condolences to Sue, his family and friends. We can all pay tribute to Al by pursuing our hobby with the same passion and vigor that he did. Rest in peace Al and may God bless. I will miss you. George V. Polman



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New Members

Thomas Heiden #2538	Audra White #2539	William Kaunitz #2540
Todd Richmond #2541	Shane Riddle #2542	Tammy Habegger-Spice #2543
Justin Willard #2544	Deb Chinn #2545	Robin Larzelere #2547
Hyejin Hwang #2548	Jim Osowski #2549	Elfguard #2550

FMS Leadership

Officers	President	Philip Neuhoff (2025)	president@uvminerals.org
	Vice President	Lee McIlvaine IV (2024)	lee@uvminerals.org
	Secretary	Melissa Applebee-Garcia	melissa@uvminerals.org
	Treasurer	Andrew SIlver (2024)	treasurer@uvminerals.org
Directors		Michael Crawford (2024)	mikecrawford@uvminerals.org
		George Adelman (2026)	george@uvminerals.org
		Bruce Bannon (2025)	brucebannon@uvminerals.org
		Stephanie Koles (2025)	stephanie@uvminerals.org
		Doug Bank (2024)	doug@uvminerals.org
		Daniel Moore (202)	daniel@uvminerals.org
Committees	Membership Chair	Melissa Applebee-Garcia	membership@uvminerals.org
	Publications		
	UV Waves Editor	Howie Green	uvwaves@uvminerals.org
	UV Waves Production Executive	Andrew Silver	andrew@uvminerals.org
	Journal Editor	Philip Neuhoff	philip@uvminerals.org
	Social Media Chair		
	Website Chair	Simone Conti	webmaster@uvminerals.org
	Nominating Committee		nominating@uvminerals.org
	Hall of Fame	Jan Wittenberg	jan@uvminerals.org
	Chapters Chair	Vice President	chapters@uvminerals.org
Chapters	Southwest	Rick Olsen	southwest@uvminerals.org
	Rocky Mountain (RMC)	Brian Walko	rockies@uvminerals.org
	Northwest (NWC)	Jennifer Moore	northwest@uvminerals.org
	Southern California (SCC)	David Stuck	southernca@uvminerals.org
	Northeast Region Fluoresophiles (NERFs)	Howie Green	northeast@uvminerals.org
	Northern California (NCC)	Glenn Waychunas	northernca@uvminerals.org
	Midwest (MWC)	Chris Clemens	midwest@uvminerals.org
	European Fluorescent Mineral Circle (EFMC)		europe@uvminerals.org
	Facebook	Mark Cole	facebookgroup@uvminerals.org
	Research (Res)	Philip Neuhoff	research@uvminerals.org

The FMS Board of Directors meets via teleconference on the third Thursday of each month at 6:00 p.m. Pacific Time. All FMS members are welcome to attend Board meetings. To do so, you must first contact a Board member to obtain the phone number and access code that directs you to our conference.

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