Northwest
Micro Mineral
Study Group

MICRO PROBE

Fall, 2019 VOLUME XII, Number 10

Fall MEETING . . . . .CAMAS, WASHINGTON

November 2, 2019 9:30 am to 4:30 pm

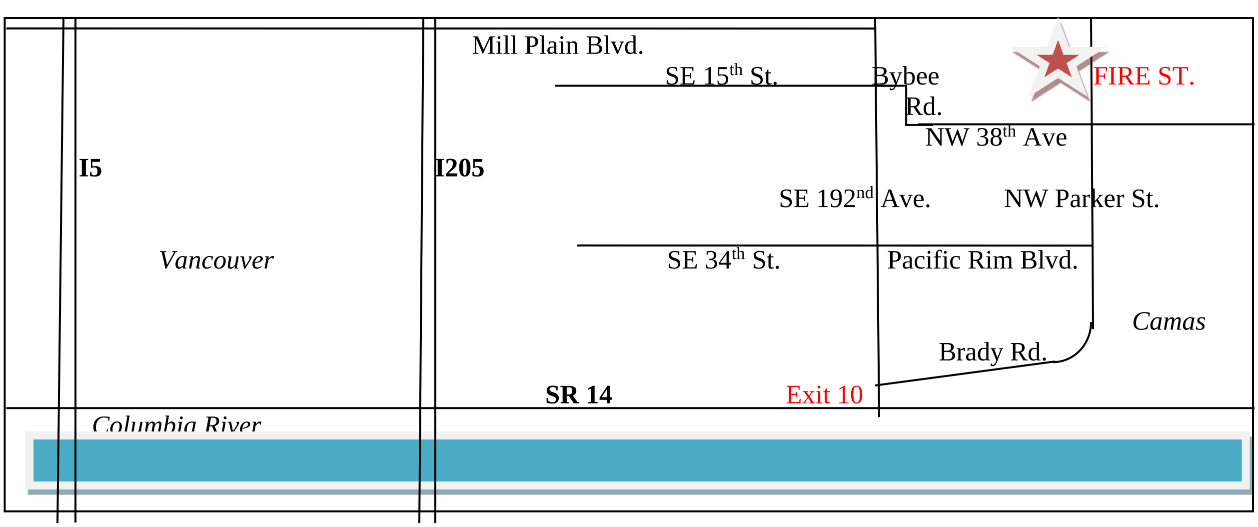
Camas-Washougal Fire Station #42
4321 NW Parker Street
Camas, Washington

We are looking forward to returning to our familiar haunts for another day of fun and fellowship together examining minerals and exchanging stories. Bring microscopes and things for the give-away tables as usual.

We will be meeting again at the fire station in Camas. To get there, from north or south, take I205 and come off onto SR14 just north of the Columbia River headed for Camas. From the east, you are already on SR14. Take exit 10 onto SE192nd Ave. An immediate right turn will put you on Brady Rd., which will soon swing around to become Parker St. There are name changes on streets between Vancouver & Camas, but don't let that throw you!

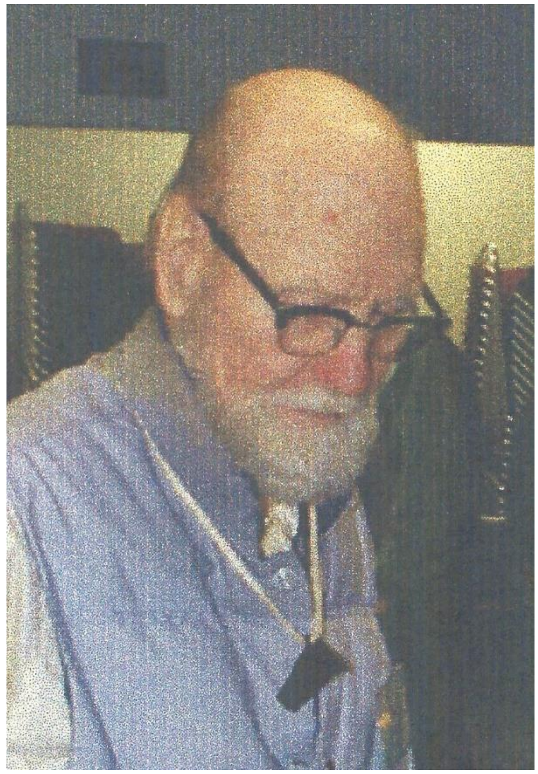
We will have the Club provide sandwich makings (bread, meat, lettuce, cheese, dressings, and coffee, tea, cocoa) for our lunch potluck: Please bring salads, chips, pop, nuts, chili, cookies, pie, or cake to add to the lunch.

We will have our usual opportunity to share mineral pictures and to view those of others. Bring your pictures on a thumb drive or as a Powerpoint program so we all may enjoy and learn from them.



In Memory of

ROBERT BOGGS



It is with great sadness to have to report the passing of Bob Boggs the middle of May this year. Bob had managed to reach an age of 101 in January. He was one of the founding members of our Study Group, and was a regular contributor up until the last few years.

There were times in the past when we thought that Bob was probably indestructible. I remember trying to keep up with him, 20 years my senior, as we climbed the track up into the Liberty Bell scree. Bob was an indefatigable mineral collector. It was his tenacity in working at the Neer Road site at Goble that disclosed the source of tschernichite and led to discovering the companion zeolite, boggsite, which was named in honor of him.

Bob had a life-long affection for the Golden Horn and its minerals. He examined them, and he studied them. We have lost a treasure trove of knowledge about that area. Bob knew each boulder that produced such interesting new minerals, and had a joy in sharing that information with others. A trip to Washington Pass with Bob was an especially rewarding experience. My memories of collecting with him at Gold Hill, or Majuba Hill, or any of dozens of other locations will bring a smile to my face every time. I will miss those times, and feel sorry that future collectors cannot have a chance at that experience. We will all miss you profoundly, Bob.

Don Howard

Mineral Environments: Sedimentary

Don Howard

I am sure you have had the experience: you have a pretty little unknown and you approach someone who seems to know a lot about identifying minerals, and the first thing they ask you is, where it was found. Why is that? How does that information help them come up with a good guess as to what your mineral might be?

The simplest answer is: the person may be familiar with that particular mine or quarry and know what things are found there. But beyond that, minerals are the products of their environments. Their chemical composition is often closely related to the general type of rock involved, and probably similar to the composition of other minerals from the same vicinity. A general knowledge of what sorts of minerals tend to be found in each type of rock can be a great help in guessing what a given mineral might be.

The most general segregation of rock types is the classic Igneous, Metamorphic and Sedimentary. There are further divisions into special rock types based on a variety of conditions, each often leading to its own characteristic suite of minerals. The usual way of dealing with this is to start with the igneous, maybe do the metamorphic, and probably give little discussion to the sedimentary, assuming sedimentary environments are not very good places to look for minerals. I would like to consider all three general areas in the next few issues, but to consider sedimentary first. It will turn out that discussing metamorphic rock requires knowledge of both of the other two types, and there are similar considerations in dealing with each of the three.

So what are sediments? They are the result of processes of erosion, and are therefore composed of a variety of bits of rock of different origins. Some of the processes are slow, like wind erosion, and results in very fine particles spread over a very wide area. Others are fast, like floods and landslides, that are capable of moving large boulders as well as fine soils.

Let's start with considering the results of these catastrophic events. Large piles are left behind, often filling valleys. Stream erosion will later cut down into this debris and expose the larger chunks as well as the finer soil-like material. A good example of this as a source of interesting specimens would be Sunday Creek in eastern King Co., Washington (*Microprobe,* Vol. VI, #9, Pg. 9, 1989). The mineralization is metamorphic in nature – titanite, tourmaline and adularia in a bed of clinochlore. It can prove profitable to recheck such a location every year or so to see what fresh material has weathered out of the banks of the stream. Another site probably of similar origin is the gismondine location along the highway just west of Lake Hariett in Clackamas Co., Oregon (*Microprobe*, Vol. VI, #6, Pg. 1, 1988). The paulingite and filiform pyrite came from float rocks uncovered during the building of the Rock

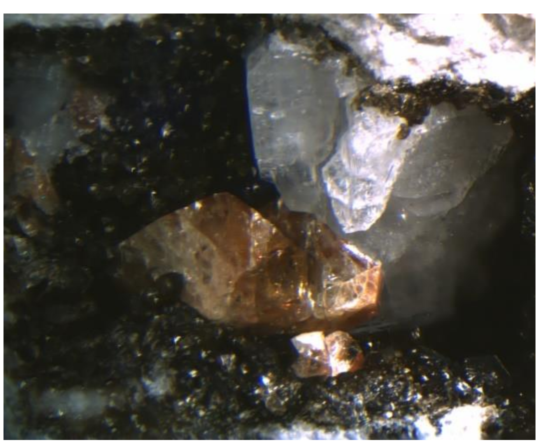


Fig. 1 Titanite and Adularia in Clinochlore
Sunday Creek, King Co., Washington

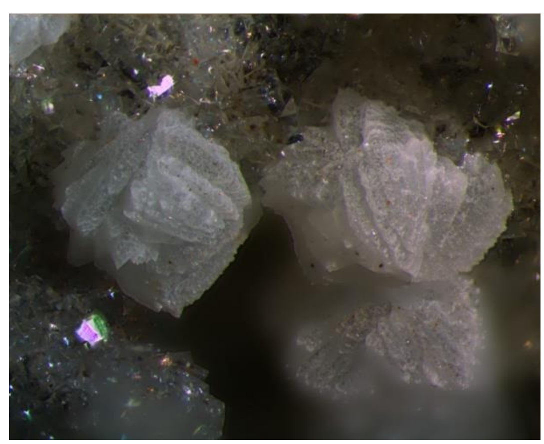


Fig. 2 Gismondine on Chabazite
Oak Grove Fork, Clackamas River, Oregon

Island Dam on the Columbia River in Washington (*Microprobe*, Vol. VII, #4, Pg. 4, 1991). Nevertheless, that site is listed as the type location for paulingite-K.

Events such as eruptions and floods often cover a large portion of land with thick layers of fine material. The plants are swept under overlying strata. Larger woody plants thus buried can become petrified over time from minerals in the ground water. The ground covers along with leaf litter can produce organic compounds, things like ammonium compounds and organic acids, such as oxalic acid. Calcium oxalate is particular insoluble in water, so ground waters containing soluble calcium ions can create calcium oxalate minerals, such as weddellite and whewellite. This is what is believed to have happened in shallow lakes in what is now the Biggs area of Sherman Co., Oregon, (*Microprobe,* Vol. XI, #11, Pg 11, 2010), where calcium oxalate minerals are found in cavities in sediments that have been converted into chert/jasper.

Fig. 3 Weddellite
Fulton Canyon Quarry, Biggs, Sherman Co., Oregon
PHOTO: Saul Krotki

In other places, large bodies of organic material, such as peat bogs, have been covered and converted into coal deposits. Coal is not something that most of us consider to be collectable material. However, there are unique minerals that form in just such environments. This is particularly true when the organic material encounters beds rich in bauxite. Mellite and kochsandorite are two such Hungarian minerals that were illustrated in the last issue of the Microprobe. (*Microprobe,* Vol. XII, #9, Pg 6, 2019)

Surface water runoff does not always reach the ocean. There are numerous places on the Earth where waters collect and evaporate, leaving the chemicals behind in the form of minerals. One such place is the Bonneville Salt Flats in Utah. There, halite crystals can be found growing in every puddle that accumulates. The calcium in the water forms tiny gypsum crystals underneath the halite.

Fig. 4 Halite cubes forming on a branch of tumbleweed
Bonneville Salt Flats, Tooele Co., Utah

In other regions, the suite of soluble chemical may be different, depending on the mineralogy of the area being drained. In southern California, much of the soluble minerals are borates. Sodium borates are easily soluble. When these solutions encounter other ground water rich in calcium, magnesium and strontium, much less soluble borates form. Death Valley, Searles Lake, and Boron are sites of extensive borate mineralization. There are even borates at Tick Canyon in Los Angeles County. Searles Lake is the type locality for 10 interesting

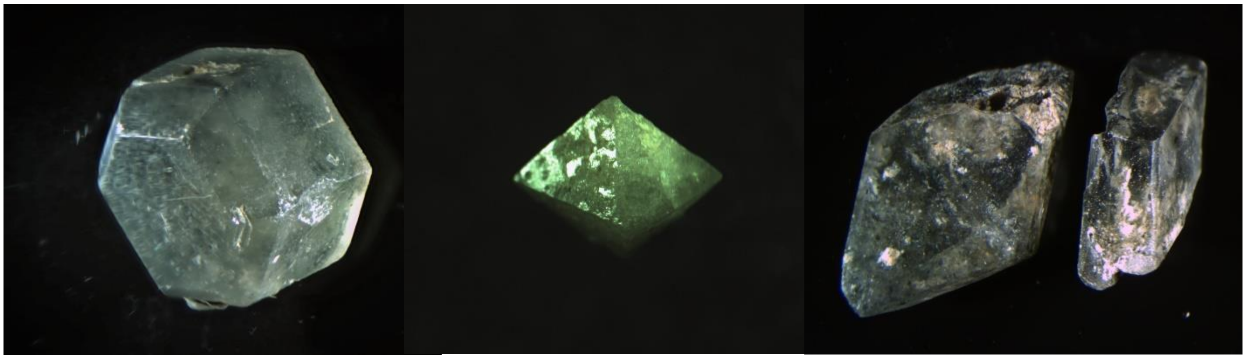


Fig. 5 *Hanksite* *Northrupite* *Pirssonite*
$KNa_{22}(SO_4)_9(CO_3)_2Cl$ $Na_6Mg_2Cl_2(CO_3)_4$ $Na_2Ca(CO_3)_2 \cdot 2\,H_2O$
Three of the type-minerals from Searles Lake, San Bernardino Co., California

minerals, including carbonates, sulfates and even silicates in addition to chloride and fluoride. Many of them come in pretty, well- formed crystals that are perfect for mounting and studying. Sadly, many either take up or lose water to the atmosphere, so that they usually require a sealed container to keep them in good form.

In contrast, the borate minerals at Boron, Kern Co., California are much less water soluble, and therefore can hold up better in a collection, though some do lose water over time and are best kept sealed. The prime calcium borates are colemanite and ulexite, while inderite and kurnakovite are the primary magnesium borates. Tick Canyon also has considerable colemanite, but in addition has the

Fig. 6 Inderite in Kurnakovite
Boron, Kern Co., Calif.

Fig. 7 Colemanite on Analcime
Tick Canyon, Los Angeles Co., Calif.

Fig. 8 Tunellite
Furnace Creek, Inyo Co., Calif.

Fig. 9 Veatchite
Tick Canyon, Los Angeles Co., Calif.

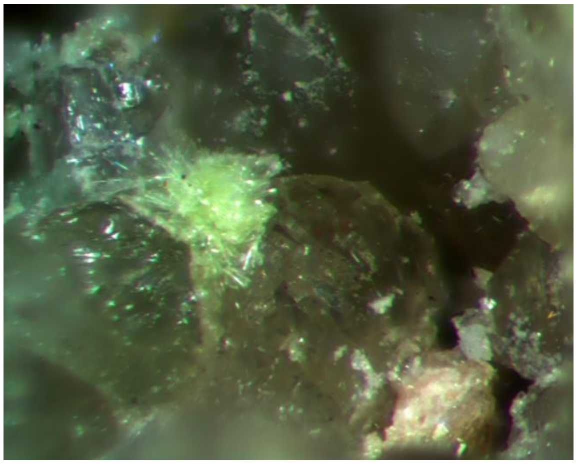


Fig. 10 Belakovskiite on Blodite
Blue Lizard Mine, San Juan Co., Utah

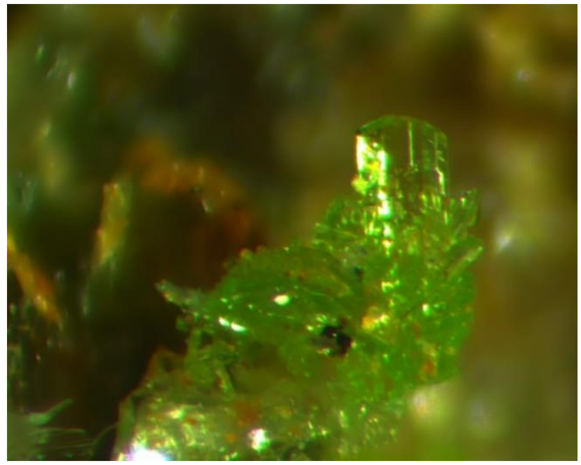


Fig. 11 Johannite
Blue Lizard Mine, San Juan Co., Utah

strontium borate, veatchite. Another strontium borate, tunellite, has been found at Boron and at Furnace Creek in Death Valley.

The soluble minerals may also be sulfates. Sulfuric acid is commonly produced naturally by the oxidation of sulfide minerals, especially marcasite and pyrite, which are common rock constituents and can become widespread in the resulting sediments. Many elements have soluble sulfates. Among them are the salts of uranium compounds. Desert areas can be a place where the solutions become concentrated by evaporation of the water, so mines originally established to extract uranium can often be a place to find unusual sulfate minerals.

One such mine is the Blue Lizard Mine in San Juan County in extreme south-eastern Utah. It is the type locality for 20 new minerals to date, and more are steadily being added. The area is primarily sandstone that has been permeated by mineralized water. Crystal crusts have formed on this, primarily blodite, $Na_2Mg(SO_4)_2 \cdot 4\,H_2O$, as small glassy grains. Hydrated sulfates of other elements form on top of this base. For copper, these are chalcanthite, kröhnkite, and johannite. For iron, they include several sulfates of sodium and ferric iron: natrojarosite, metavoltine, ferrinatrite, and sideronatrite, as well as other iron sulfates. Since most of these minerals are various shades of yellow to brown, they can be very difficult to tell apart. That problem becomes even worse for the many sodium uranyl sulfates, which

Fig. 12 Placilite
Blue Lizard Mine, San Juan Co., Utah

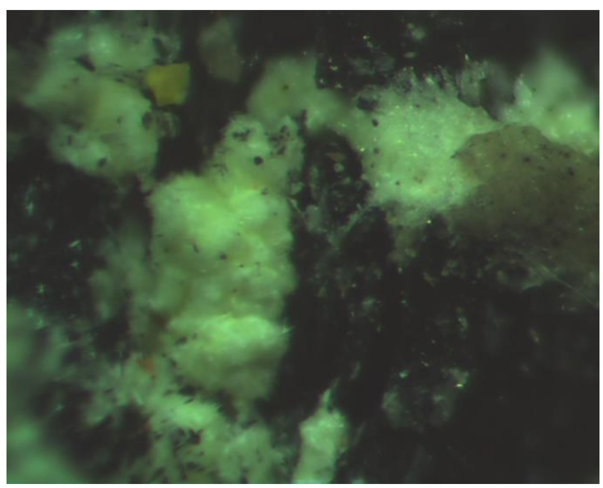
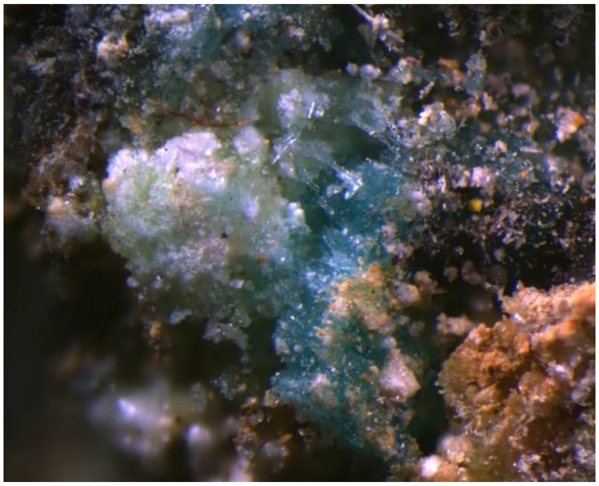


Fig. 13 Feynmanite
Markey Mine, San Juan Co., Utah



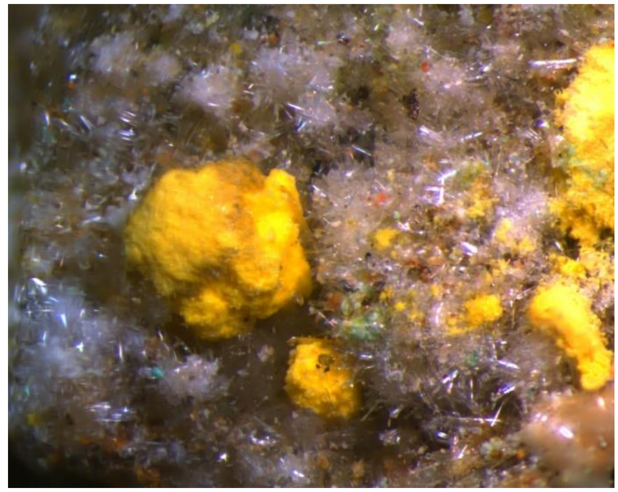
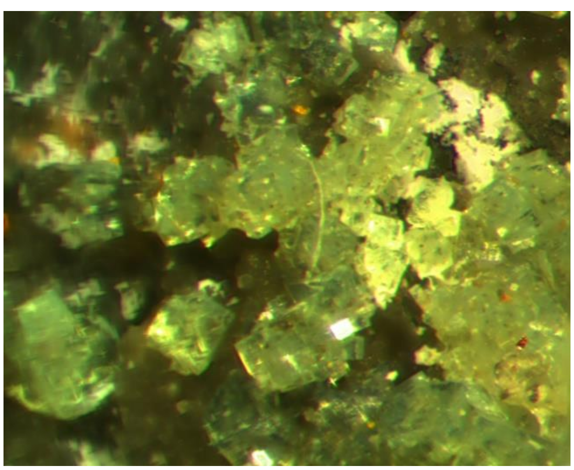


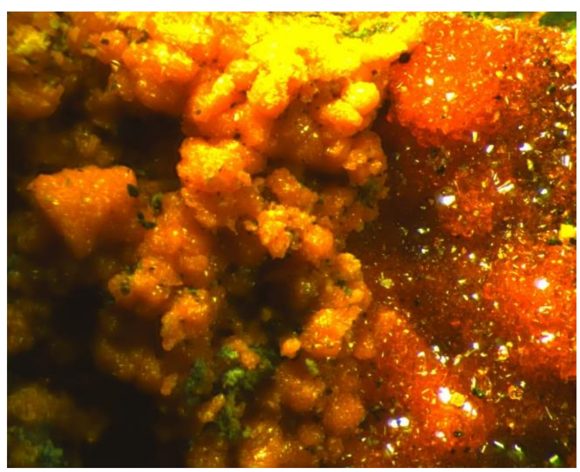
Fig. 14 Leoszilardite and Chalcanthite
Markey Mine, San Juan Co., Utah

Fig. 15 Natrozippeite
Markey Mine, San Juan Co., Utah

number over a dozen, most of which are pale green to nearly white and which all have the characteristic bright green fluorescence of the uranyl ion. This is most apparent for placilite, $Na(UO_2)(SO_4)(OH) \cdot 2 H_2O$, and Feynmanite, $Na(UO_2)(SO_4)(OH) \cdot 3.5 H_2O$, that are chemically identical but differ in the amount of water of crystallization. Since these minerals all have different crystal structures, they are identified by shapes: some are acicular and make sprays of needles, while others tend to be more platy and form crusty patches. It does not help that other minerals are also white in color and have similar kinds of habits, but at least most of them lack the fluorescent signature. A particularly difficult set are the zippeite group, of which the potassium, sodium and ammonium members are present, and often form on top of each other. Again, they are all very fluorescent.

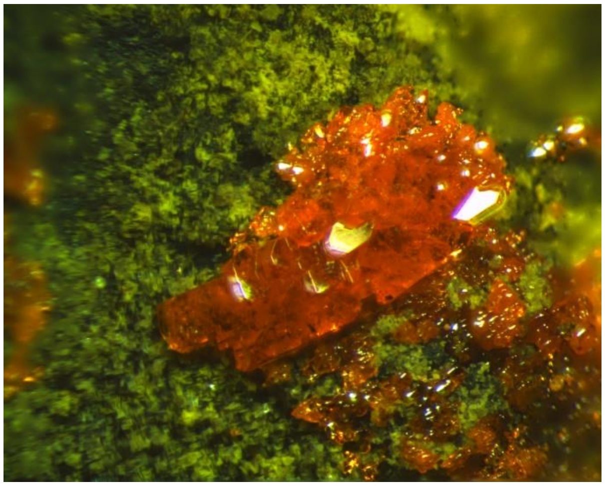
The Markey Mine is less than a mile from the Blue Lizard mine, and it has some of the same uranyl sulfates, but in addition it has some sodium uranyl carbonates. When carbon dioxide dissolves in water, it makes a dilute solution of carbonic acid, which like sulfuric acid can promote the solution of many cations. Subsequent concentration due to evaporation produces carbonates instead of sulfates. The ones occurring at Markey Mine include andersonite, cejkaite, leoszilardite and natromarkeyite.





Fiig. 16 Andersonite
Burro Mine, San Miguel Co., Colorado

Fig. 17 Huemulite
Burro Mine, San Miguel Co., Colorado



Fiig. 18 Ammoniolasalite
Burro Mine, San Miguel Co., Colorado

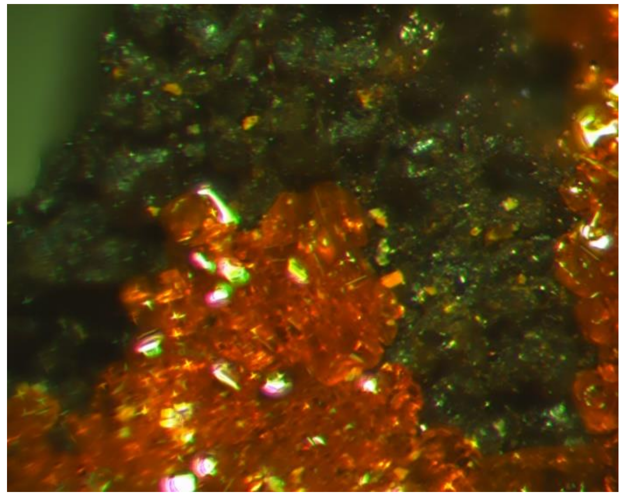


Fig. 19 Wernerbauerite
Burro Mine, San Miguel Co., Colorado

The same general terrain, the Colorado Plateau, extends across the Utah state line into southwestern Colorado. Again, there are mines that were established to prospect for uranium, and uranyl salts cause some of the rock to glow in UV light. But this is also an area rich in vanadium, so uranyl vanadates are added to the mix: carnotite, tyuyamunite, and strelkinite.. These uranyl vanadates are bright yellow in color, but they tend not to show the usual green fluorescence.

One such location is the Burro Mine, San Miguel Co., Colorado. The pascoite and magnesiopascoite from there make beautiful, brilliantly orange specimens. Pictures from that mine were featured in an article on vanadium in an issue a year ago. (*Microprobe,* Vol. XII, #8, Pg 6, 2018). We show several more pictures of vanadates from that mine in figures 17 through 19. The huemulite (fig. 17), $Na_4MgV_{10}O_{28} \cdot 24\ H_2O$, tends to dehydrate, shown at left in the photo, as contrasted to the sharp, clear fresh crystals on the right. Ammoniolasalite, $(NH_4)_2Mg_2V_{10}O_{28} \cdot 20\ H_2O$, and wernerbauerite, $(NH_4)_2Ca_2V_{10}O_{28} \cdot 16\ H_2O$ are colorful ammonium salts supposed to have been derived from organic sources in the sediments.

I hope this article has increased your awareness that interesting minerals can be found in sedimentary environments and that such locations are well worth spending time examining.

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