Northwest
Micro Mineral
Study Group

MICRO PROBE

Spring, 2020 VOLUME XIII, Number 1

Spring MEETING . . . . .CANCELLED ! ! !

That's Right.
We have been impelled by the coronavirus
to call off our Spring get-together.

Time to stay home and work through the
things you have brought back from previous trips.

We hope you stay safe and healthy.

Hopefully this whole mess will pass and
we will be able to meet again in the Fall.

May you have great collecting trips this Summer.

*The Northern California Mineralogical Association
meeting scheduled for mid-May has been postponed,
at least until mid-September.*

THE MICROPROBE

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Donald G. Howard, editor
356 SE 44th Avenue
Portland, Oregon, 97215
e-mail: pogodh@hei.net

DUES: $15 per year per mailing address, payable at the Spring meeting or by mail to the Secretary/Treasurer:
Patrick "Kelly" Starnes
1276 SE Goodnight Avenue
Corvallis, Oregon, 97333
e-mail: bikeklein@yahoo.com

Zeolite Group Update

Don Howard

Periodically, we review what minerals have been added to Zeolite Group. The last update two years ago featured the addition of several new minerals. The changes since then have been considerably more modest.

Gismomdine has been changed to **Gismondine-Ca**, mainly because of published reports that a barium gismondine has been detected in certain slags. The data for Gismondine-Ca is that given by Rudy Tschernich in *Zeolites of the World*. Gismondine-Ba is not a recognized species because there are no known. natural occurrences. Analyses of naturally occurring gismondine have found little or no barium.

There is one new species: **Martinandresite,** with a chemical composition similar to that of Harmotome. The data sheet follows.

The other addition is a type of Ferrierite containing high concentrations of ammonium ions that has been found in coal deposits in the Czech Republic and Slovakia.

FERRIERITE

Ferrierite-NH4

Type locality: Libous Quarry, Chomutov District, Usti and Labern Region, Czech Republic
Other localities:
Bilna Coal Mine, Teplice District, Usti and Labern Region, Czech Republic
Jenisuv Ujerd, Bilna, Teplice District, Usti and Labern Region, Czech Republic
Coal Deposit, Handlova,Prievidza District, Trencin Rejion, Slovakia

Martinandresite

$Ba_2 Al_4 Si_{12} O_{32} \cdot 10 H_2O$

Named for Martin Andres, who discovered the armenite locality of Wasenalp.

Type locality: Isenwegg, Wasenalp, Ganter Valley, Brig, Wallis, Switzerland.

Structure

Crystal System: Orthorhombic, mmm (Dipyramidal)
Space Group: Pmmn
Crystal axes: a=9.4640 A
b=14.2288 A
c=6.9940 A

Physical Properties

Color: white to tan
Streak:
Luster:
Hardness: **4.5**
Density: 2.482 g/cm^3
Cleavage: poor and indistinct
Twinning: cruciform twins

Optical Properties

Refractive Index:
n_a = 1.500
n_β = 1.512
n_γ =
biaxial negative
2V: 55º

Morphology

Blocky crystals to 8mm, cruciform twins to 3.5mm, aggregates up to 6cm.
Forms: {010}, with minor {100} and {001}.

Chemical Composition

$Ba_2 Al_4 Si_{12} O_{32} \cdot 10 H_2O$
Chemically related to harmotome.

Occurrence

Found in association with quartz, dickite, chlorite group minerals and armenite.

Switzerland

: Isenwegg, Wasenalp, Ganter Valley, Brig, Wallis, Switzerland.

References:

1. Chukanov, N.V., Zubkova, N.V., Meisser, N., Ansermet, S., Weiss, S., Pekov, I.V., Belakovskiy, D.I., Vozchikova, S.A., Britvin, S.N., & Pushcharovsky, D.Yu., *Martinandresite, Ba2(Al4Si12O32)·10H2O, a new zeolite from Wasenalp, Switzerland*, Mineralogy and Petrology, **44**, 511-521 (2017).

Cuprian Adamite and Zincolivenite

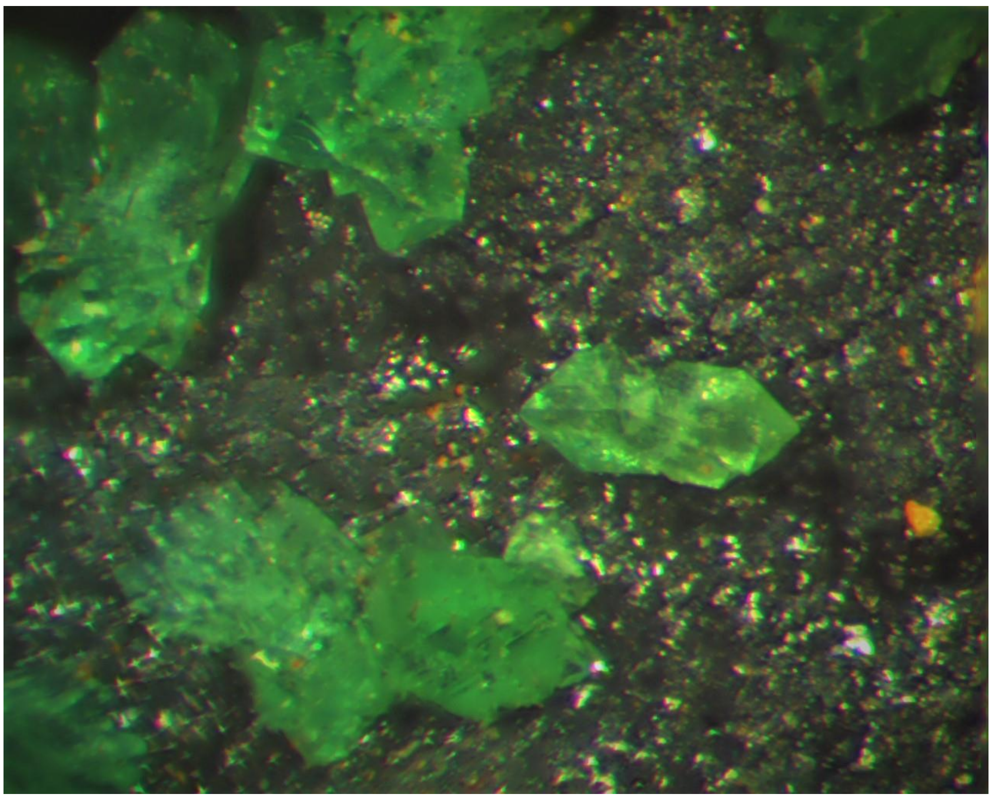
Don Howard

One of the prettiest of the green copper minerals has acquired a new name. Zincolivenite is now the proper identification for most of the material formerly designated cuprian Adamite.

Adamite is a member of the Olivenite Group, phosphates and arsenates of divalent metals. Adamite, $Zn_2AsO_4(OH)$, is the zinc-containing end-member and olivenite, $Cu_2AsO_4(OH)$, is the copper-containing end-member of what has been observed as a continuous system. The copper and zinc could substitute for each other in all proportions. As a result, mixtures with more zinc than copper were designated as *cuprian Adamite* and with more copper than zinc as *zincian Olivenite*.

There are in fact two sites for zinc ions in Adamite, and the surroundings of the zinc in each case are slightly different. The above designations would be appropriate if the copper replacing the zinc were to go into each of the sites with the same probability, so that the concentration of copper in each site were the same. But detailed studies suggest that the copper has a definite preference of one site over the other. In fact, at equal concentration the zinc occupies one site and the copper the other. This has led to recognizing Zincolivenite, $ZnCuAsO_4(OH)$, as a separate member of the Group. This means *cuprian Adamite* has a range from 0 to 25% copper and *zincian Olivenite* a range from 75 to 100% copper. The intermediate range from 25% to 75% copper is officially called *Zincolivenite.*

Specimens that qualify as *cuprian Adamite* are generally yellowish in color. The bright green clusters that were previously designated in this way have all proved to actually be *Zincolivenite*, and should be so identified. Research suggests that adamite specimens that meet the current criterion of less than 25% copper are generally yellowish in color rather than bright green.



Zincolivenite (formerly *cuprian Adamite*) *on hydrohaeterolite*

Gold Hill Mine, Tooele Co., Utah

Mineral Environments: Igneous

Don Howard

In the last issue, we talked about sedimentary rock and some of the minerals associated with it. Another major classification of rock types is the igneous, the high temperature environments that bring up new material. Basically, we shall identify two types of igneous environments, based on how slowly the rock manages to cool initially.

Eruptive episodes usually involve lava that manages to cool rather rapidly, and thus minimize the time over which crystalline minerals have to form. The most rapid cooling favors freezing the melt into a glass rather than forming orderly crystalline solids and the result is obsidian. If enough cooling has occurred before the molten mass is ejected, then there may be the beginnings of crystal formation of the highest temperature minerals, and these can act as seed for further growth within the rapidly cooling glass. Cristobalite is often that first mineral, and this results in the spherical white regions in snowflake obsidian. If the regions grow a little further, spheres of cristobalite segregate, often shrinking to leave voids in which the still-hot vapors can deposit other small crystals. Obsidians from Coso Hot Springs, Inyo Co., and Mono Craters, Mono Co. California both exhibit these kinds of specimens. The blades of fayalite from Coso Hot Springs are very thin and very clear (fig. 1).

Fig. 1. ***Fayalite on Cristobalite***
Coso Hot Springs, Inyo Co., California

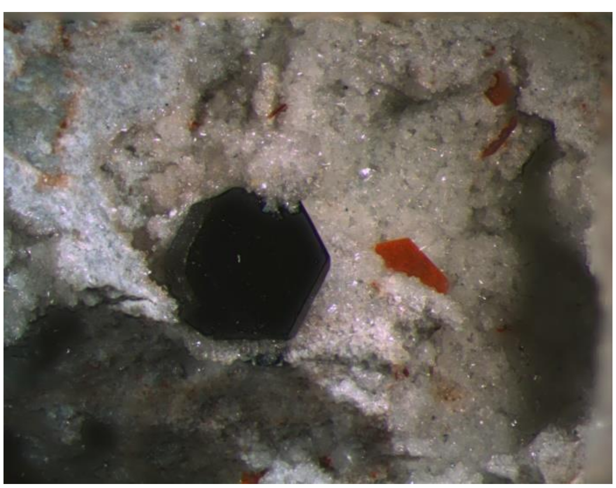


Fig. 2. ***Osumilite and Phlogopite***
Obsidian Cliffs, Lane Co., Oregon

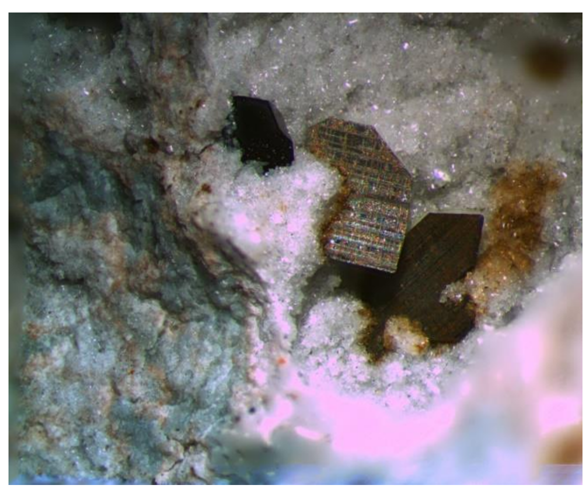


Fig. 3. ***Laihunite and Osumilite***
Obsidian Cliffs, Lane Co., Oregon

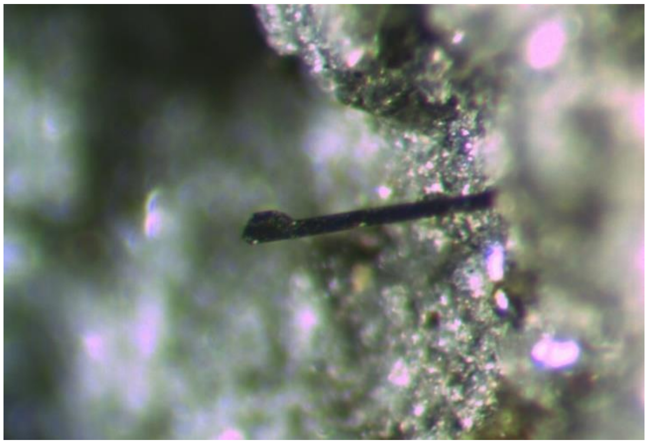


Fig. 4, ***Filiform Ilmenite***
Lemolo Lake, Douglas Co., Oregon

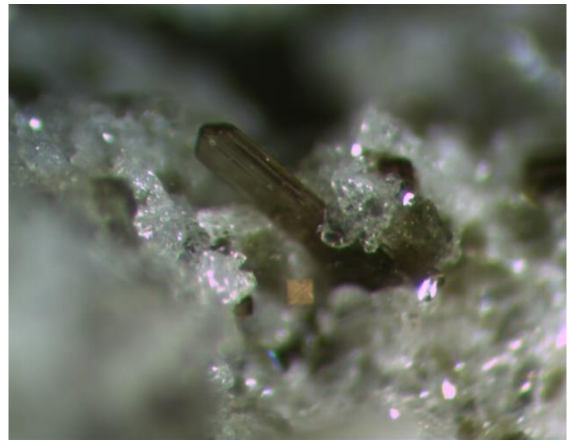


Fig. 5. ***Enstatite and Zircon (pink)***
Summit Rock, Klamath Co., Oregon

If there are a lot of dissolved gases in the lava, outgassing can generate a froth that solidifies into scoria. Again, vapors present can produce small crystals of minerals like osumilite, pseudobrookite, topaz, and phlogopite. The scorias at Obsidian Cliffs, Lane Co., Oregon and Mt. Ngangataha, New Zealand are examples of the interesting minerals thus formed. Both also show olivine group minerals, but those scorias had considerably more oxygen present than with the obsidian, so the crystals are not clear. The fayalite from Obsidian Cliffs has an outer coating of laihunite that is opaque and looks metallic (fig. 3). The matrix material at Obsidian Cliffs is tridymite.

In the rocks at Lemolo Lake and Summit Rock, the small crystals formed are enstatite, ilmenite, zircon, fluoroedenite, augite, pseudobrookite, hedenbergite and various feldspars together with some very interesting rarities, such as cuprorivaite and volborthite.

Basalt, that is common and widespread in the northwest, is especially fluid, and in spreading out tends to cool quickly. The individual crystallites in basalt are therefore very small, and a considerable fraction of the bulk is actually composed of small regions of obsidian. Also, basalt often outgasses and therefore has a profusion of bubbles. Ground water tends to break down the uncrystallized glasses rather rapidly, releasing magnesium and iron silicates to form

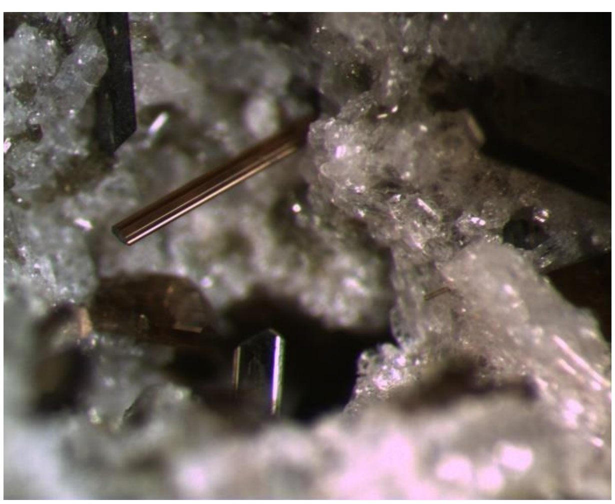


Fig 6. ***Fluoroedenite and Enstatite***
Summit Rock, Klamath Co., Oregon

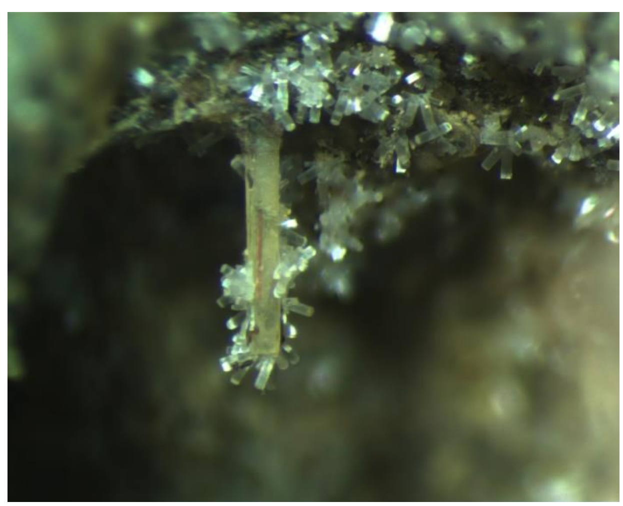


Fig. 7. ***Erionite on Merlinoite***
Pollena Q., Mt. Somma, Napoli, Italy

Fig. 8. ***Leucite***
Roccamonfina, Caserta, Italy

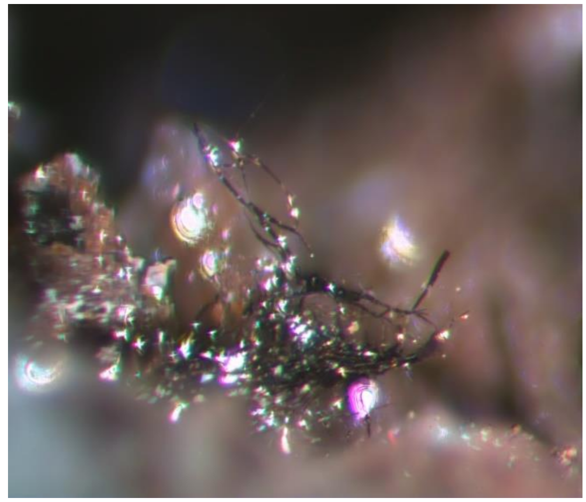


Fig. 9. ***Tenorite***
Vesuvius, Napoli, Italy

clays that line those cavities, and also providing the aluminum to form the zeolites that often grow upon the clays. Zeolites can be found in many rock environments, but they are particularly common in weathered igneous rock. Due to the wide variations in the conditions under which they form, each environment tends to harbor a different suite of zeolite minerals, including some of the rarer ones. Fig. 7 shows one of the less common, merlinoite, from a quarry on the remains of Mt. Vesuvius. Fig. 8 shows a crystal of leucite, an anhydrous zeolite that forms as a primary mineral at higher temperature, also from Mt. Vesuvius.

Just as with the cuprorivaite at Summit Rock, Mt. Vesuvius has unusual high-temperature minerals. One such is the copper oxide mineral, tenorite. The usual copper oxide is cuprite, Cu_2O, a cubic mineral formed at low temperature in secondary oxidized ore regions. Tenorite, CuO, is a monoclinic mineral formed by sublimation at high temperature as thin, twisted ribbons. Fig. 9 shows some of these ribbons from the 1944 lava, which is the type locality.

One particularly interesting area for quarries in igneous rock is the Eifel region in western Germany. Both interesting minerals and interesting forms of more common minerals are found there, such as the clustered spray of topaz shown in fig. 10 and the small clear leucite crystals shown

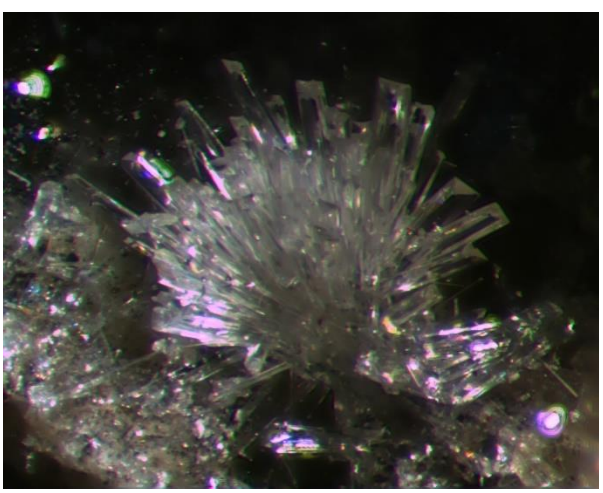


Fig. 10. ***Topaz***
Emmelsberg, Eifel, Germany

Fig. 11. ***Leucite and Melilite***
Graulai Quarry, Eifel, Germany

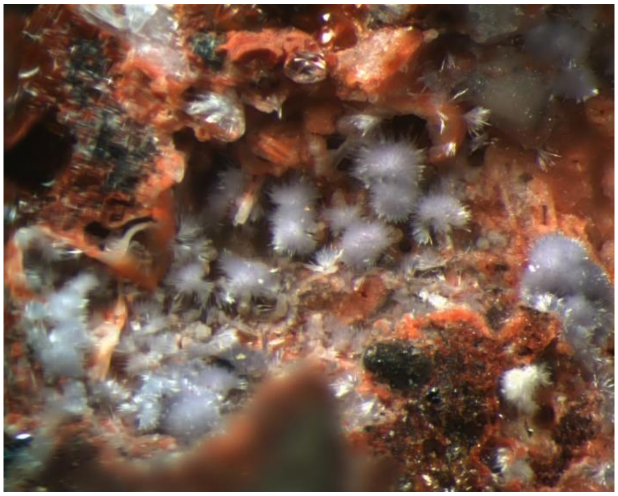


Fig. 12. ***Mullite***
Bellerberg Quarry, Eifel, Germany

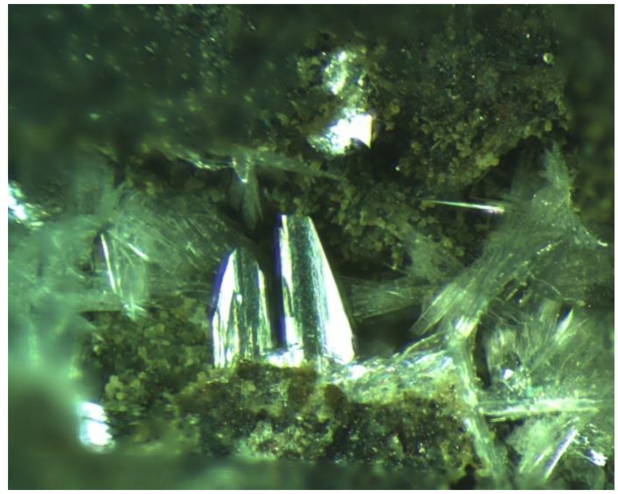


Fig. 13. ***Hannebachite***
Hannebacher Ley, Eifel, Germany

shown in fig. 11. There are high temperature minerals such as mullite (fig. 12). There are odd, twinned "trees" of perovskite and other minerals. There are unusual chemical combinations, such as the calcium sulfite, hannebachite (fig. 13) and the aluminum borate, jeremejevite (fig. 14). Mindat lists numerous quarries in the region that boast of over a hundred minerals each. One reason for this being such a rich region for minerals is the many quarries and the fact that they have been active over a very long time. This is another region rich in unusual and well crystallized zeolites.

Not all igneous environments are a result of lava flowing freely to the surface of the Earth. Many important igneous rock environments are described as intrusive, where hot rock is squeezed up into other types of rock. Intrusives cool very slowly, allowing individual crystallites to grow into larger regions. Typical of this are the granites, where each mineral is an easily discernable component of the whole. Since the grains are in contact with each other, they seldom show free faces, but the grains can be large. I visited a quarry near the Royal Gorge in Colorado as a teenager where Quartz and feldspar grains were several inches across. The quarry had been used to extract muscovite sheets of a similar size to be used as insulators and windows. Each

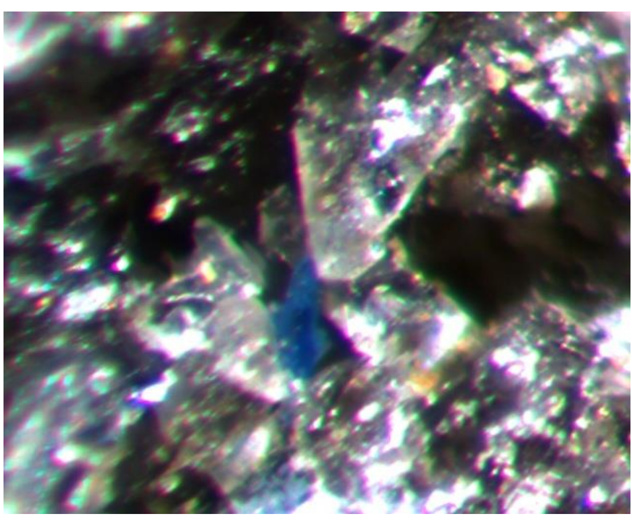


Fig. 14. ***Jeremejevite on Sanidine***
Emmelsberg, Eifel, Germany

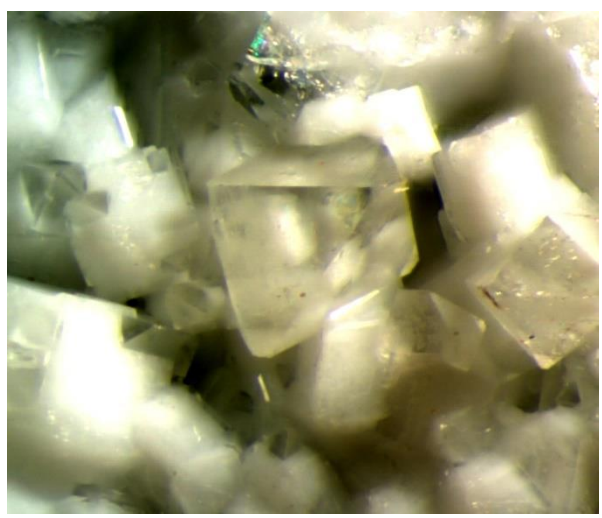


Fig. 15. ***Gismondine (single crystal)***
Arensberg, Eifel, Germany

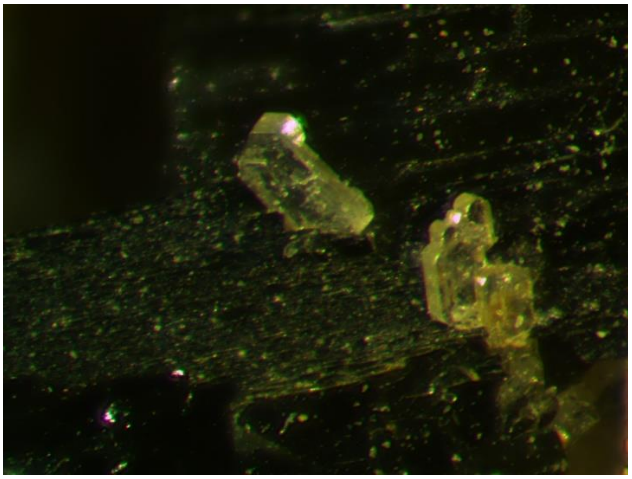


Fig. 16. ***Zektzerite on Arfvedsonite***
Washington Pass, Okanogan Co., WA

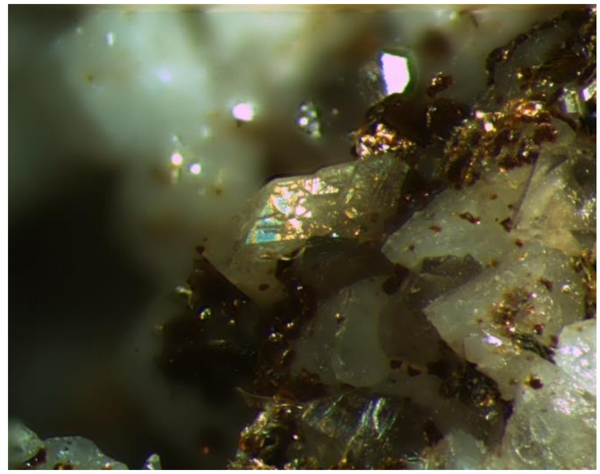


Fig. 17. ***Kainosite with Chamosite***
Liberty Bell, Washington Pass, WA

intrusive has its own unique chemistry, especially in regard to the trace elements present, and therefore will have different interesting minor minerals containing those elements.

The size of the intrusives varies a great deal. Large masses, when exposed by weathering, can often be many square miles in diameter. These are sometimes referred to as batholiths or plutons. Notable ones include the Kola peninsula in Russia, the Darai-Pioz valley in Tajikistan, and Mt. Ste. Hilaire in Canada. We are fortunate to have such a region in the Golden Horn at Washington Pass.

The Golden Horn is a granite batholith that has considerable zirconium and therefore has unusual zirconium minerals. A notable one is zektzerite, both as discernable crystals (fig. 16) and as a constituent of the matrix, where only its fluorescence distinguishes it from the feldspar surrounding it. Another zirconium mineral is kainosite, a white orthorhombic mineral shown in the center of fig. 17. The granite at Washington Pass also exhibits numerous minerals containing the rare earth elements, principally yttrium and cerium.

Mt. Ste. Hilaire is a similar environment containing a similar array of unusual minerals. Unlike Washington Pass, which is rather remote and only accessible on naturally exposed

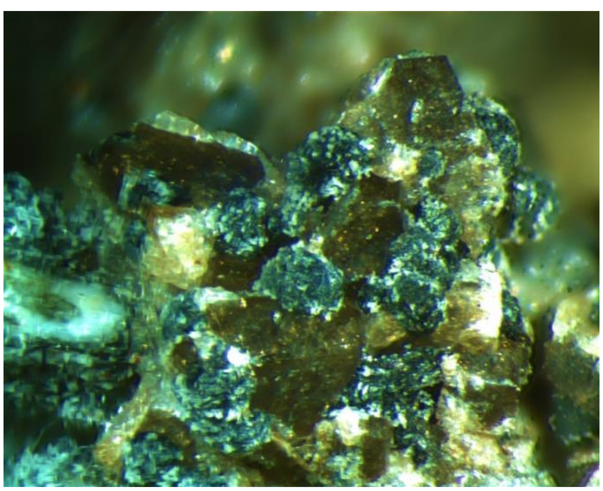


Fig. 18. ***Hilairite (glassy brown)***
Mt. Ste. Hilaire, Quebec, Canada

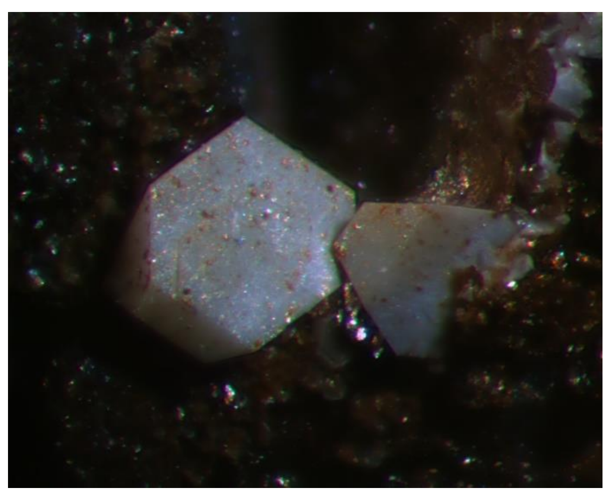


Fig. 19. ***Calciohilairite***
Liberty Bell, Washington Pass, WA

Fig. 20. ***Turkestanite in Albite***
Dara-I-Pioz Valley, Tadjikistan

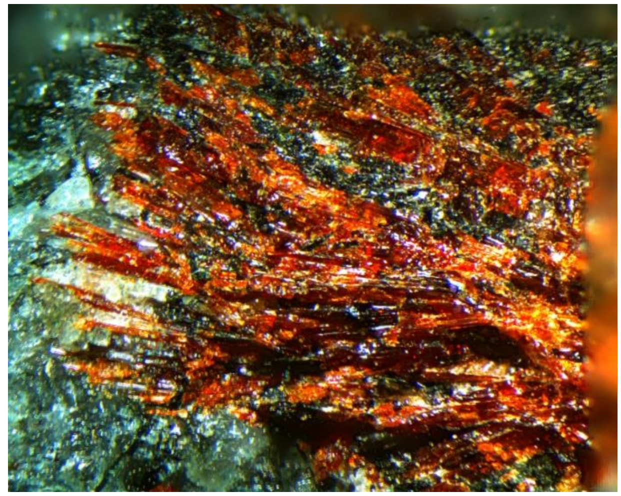


Fig. 21. ***Normandite***
Partomekerr Mt., Khibiny, Kola, Russia

surfaces, Mt. Ste. Hilaire has been extensively quarried and therefore more of the unusual minerals have been recognized and described. Similar comments can be made for the Darai-Pioz Valley, which is very remote and hard to reach, and the Khibiny Massif on the Kola Peninsula, which is much more developed.

Pegmatites, being in general smaller bodies, are much more common and widespread. Unfortunately, we are not richly endowed with interesting pegmatites here in the Northwest, but there are some notable occurrences elsewhere around the United States. The lithium and rare earth rich ones at Pala in San Diego Co., California have produced beautiful, gem-quality crystals of tourmaline, garnets, and beryl. There are phosphate rich pegmatites around Custer, South Dakota and North Groton, New Hampshire that have yielded specimens of dozens of unusual phosphate minerals. Other rare phosphates and silicates have come from the lithium rich Foote Mine, Kings Mountain, North Carolina.

I was able several years ago to visit a lithium rich pegmatite at Cattlin Creek, Ravensthorpe, Western Australia. I remember the walls contained opaque green spodumene crystals several inches in diameter and several feet long. The tourmaline was in a variety of

Fig. 22. ***Elbaite***
Himalaya Mine, San Diego Co., Calif.

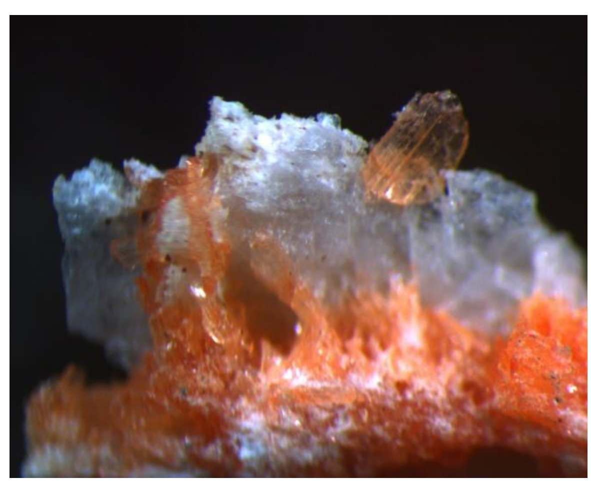


Fig. 23. ***Montgomeryite***
Tip Top Mine, Custer Co., So. Dakota

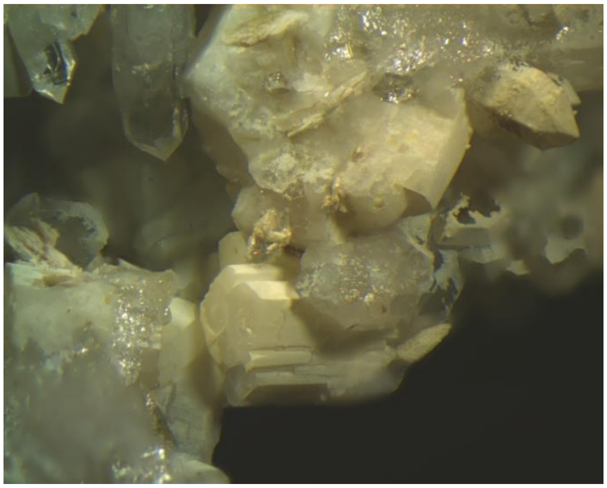


Fig. 24. ***Goyazite on Quartz***
Palermo Mine, North Groton, N.H.

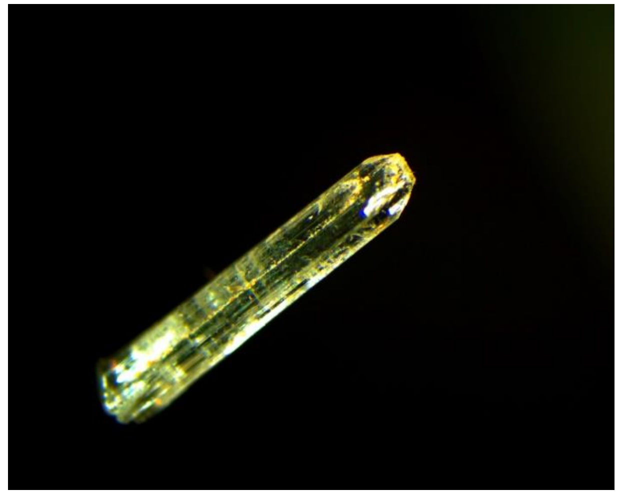


Fig. 25. ***Palermoite***
Palermo Mine, North Groton, N.H.

pastel colors, and the crystals of tantalite were up to an inch square. There was lepidolite and a variety of white minerals containing lithium. It was fascinating.

I hope this brief look at the minerals of igneous environments will spark a curiosity in many of you to look a little more deeply into the kind of environment our minerals come from. It can be very useful in making educated guesses into the associated minerals that may also be on the same specimens. Knowing something of the associations likely in a given environment helps greatly in identification.

This article on igneous environments, and the preceding one on sedimentary environments will now set the stage for the final article in this series about what happens when hot intrusive rock squeezes into sedimentary rock. Next issue, we will be looking at the common and unusual minerals to be found in the **metamorphic environment.**

Fig. 26. Lithiophilite
Foote Mine, Cleveland Co., S.C.

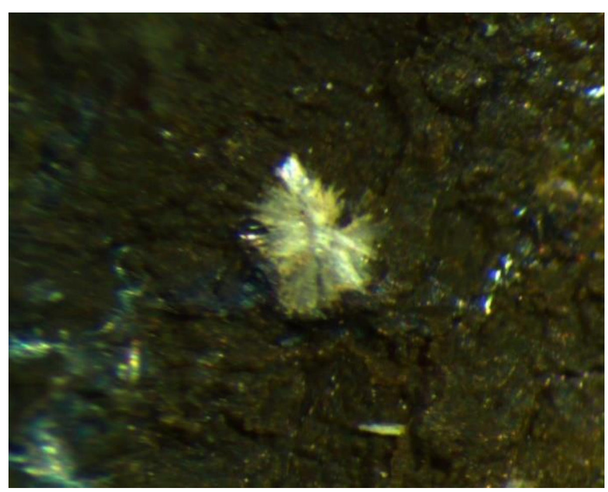


Fig. 27. ***Kingsmountite***
Foote Mine, Cleveland Co., S.C.

Fig. 28. ***Tantalite-(Fe) with Muscovite in Spodumene and Quartz***
Cattlin Creek, Ravensthorpe, Western Australia