Northwest Micro Mineral Study Group



MICRO PROBE

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SPRING MEETINGCAMAS, WASHINGTON

May 7, 2016

9:30 am to 4:30 pm

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

Alas, once again the Vancouver PUD Building has become unavailable, so we will be meeting a few miles east at a fire station in Camas. We hope to see you all there.

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 and Camas, but don't let that throw you!

Bring microscopes and things for the give-away tables as usual. 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.

After lunch, Doug Merson will again be sharing his illustrations of **The Minerals of Mont Sainte Hilaire.** Do bring the pictures you have to share with the group. We would love to see them.

We will plan to gather for dinner afterward for those who are interested.

		SE 15 th St. Bybee Rt.
5	205	NW 38 th Ave SE 192 nd Ave. NW Parker St.
Vancouver		SE 34 th St Pacific Rim Blvd
Vuncouver		Brady Rd.
		SR 14 Exit 10
Columbia River		

IN MEMORY OF MICKEY MARKS



It was sad to hear of the passing of another member of long standing, Mickey Marks, on August 3, 2015. Mickey has been a quiet but enthusiastic presence in our meetings for many years. I first became acquainted with him at the monthly get-togethers we in the Portland area were privileged to have at Beulah and Phil Murphy's house. Mickey had begun collecting in the New England area before moving to Portland, and therefore had much to learn of the minerals of this area and a good deal to teach us of the minerals of the Northeast. In that way, we all profited greatly.

Mickey and his wife Lynn loved to travel the world, and were often gone to exotic places. In that way, too, he brought us a richness of experiences beyond our own backyard.

Left behind was the large number of specimens, both boxed and loose, but all carefully labeled and identified. Beth Heesacker has arranged with Lynn to acquire his material, and has made some of it available to the rest of the group at recent meetings. The rest she is preserving as a valuable collection.

We are sad to lose another good friend and collector, but can rejoice in the memories of good times of fellowship. We send our condolences to Lynn on her loss.

Donald Howard

Micromounters Hall of Fame Award

Beth Heesacker

Beginning in 1975, the Baltimore Mineral Society established a Hall of Fame for Micromounters, in a effort to:

honor those who have supported and promoted this aspect of the mineral hobby to the highest degree. Those selected have often written articles or a column for a notable mineral publication, founded a micromount symposium or club, given lectures, promoted and taught micromounting to others, built sizeable collections, discovered new minerals etc. By their efforts over a period of years, they have earned a world-wide reputation among mineral collectors in general and especially among micromounters.

from the Baltimore Mineral website: http://www.baltimoremineralsociety.org/halloffame/historyandmembership.html

In October, 2015, Don Howard travelled to the Baltimore Mineral Symposium to receive this honor and to be inducted into the Hall of Fame. We offer our congratulations.

I know personally that he richly deserves this honor. In addition to his regular attendance at our meetings, his service as a past president and current Microprobe editor, he regularly attends the Northern California Mineralogical Association meetings, bringing back many flats of micro minerals to share with our Group. He also hosts monthly mineral identification meetings which a few of us "newbies" attend. He has been very helpful in assisting me to learn how to identify many minerals in my collection.



A Point to Ponder

Noel Kennon (Reprinted from the Australian and New Zealand Micromineral News) (Issue 12 January, 2016)

Here is a question for all micromounters: "How many mineral species do you have in your collection?"

If you are a beginner you may have several dozen, and rather more – perhaps into the 100's – if you have been collecting for a few years. If you try to collect the full suite of minerals from various localities, your collection could be quite limited, but if you collect everything that comes your way, the number could be quite large.

You might be interested to ponder how many it would be if you had a specimen of every species listed in Fleischer's Glossary of Mineral Species – the globally accepted authority for known mineral species as well as the spelling of the names. The latest edition (the eleventh), prepared by Malcolm E. Black and published in 2014, lists 4776 species. Curiously, the book does not state that number anywhere, so I counted them – you can check my accuracy if you wish. Only a few hundred of those 4776 species occur as cabinet sized specimens. More occur as miniatures and thumbnails – but all occur as micros.

The number of accepted species is increasing each year as possible new species are found, analyzed, examined, and the relevant data submitted to the International Mineralogical Association for adjudication. Upon approval of a single submission, the number of accepted species is increased by one. Clearly, there are undiscovered mineral species out there awaiting a collector with curiosity and a geological pick. Are we nearing the end of the new discoveries or have we barely scratched the surface? The latter seems more probable, and so the question arises: "What is the total number of mineral species that could conceivably exist on the accessible part of the crust of this planet?"

Surprisingly, it is possible to derive an answer to this question. To get that answer, it is necessary to accept that the crust of the Earth is nature's massive chemical laboratory, and the naturally occurring chemical compounds made in this laboratory are, of course, our minerals. That laboratory contains every naturally occurring chemical element, and the existing physical conditions embrace very large ranges of composition, temperature, pressure, and all of the other system variables. All possible combinations of these factors result in nature experimenting with every possible combination of chemical elements. Favourable thermodynamic and kinetic conditions, which will inevitably occur, will ultimately lead to the formation of every chemical compound that could be synthesized in the best manmade laboratory – if it could be made by man, it certainly can be made by nature. And how many compounds could mankind conceivably synthesise? The best estimates given to me by chemists such as Pete Williams at the University of Western Sydney and the late Leon Kane-Maguire of the University of Wollongong is about two million!! And so that is one assessment of the number of potential mineral species.

The majority of newly discovered minerals are microscopic, although every now and then a bigger type specimen turns up. We can expect this trend to continue, so look hard at your micros – you could just be the person to find one of that massive number of so far undiscovered species.

Editor's Note: New Species

Steve Sorrell, the editor of the Australian and New Zealand Micromineral News, goes on to speculate on making new finds, especially in existing collections. His definition of "new" was:

- New mineral species
- Mineral not previously recorded at a locality
- Exceptional occurrence size, rarity, aesthetics
- Combination of species
- "Lost" or unusual locality
- Not seen today, or for a long time

and he mentions a number of constraints around collecting and finding new material, such as:

- Current day mining operations Blast it!
- Litigation-minded people access issues
- Mindset: There's nothing left so why bother?
- Mindset: I've been there lots of tomes ditto
- The aging population (of Rockhounds)
- Younger people not interested

On the other hand, he suggests a number of advantages that we have today:

- Access to the internet (eg: Mindat and other sites)
- Ability to share information globally and almost instantaneously
- Better microscopes, lighting, and cameras
- Access to facilities for, and simplified methods of testing

So the message is, we need to pay attention and go back over the material in our collections. We steadily grow more experienced in our abilities to identify minerals, and often going back over past material allows us to recognize things that are misidentified or different.

I can think of some good examples in the past. Tschernichite sat in Rudy's collection for several years labeled as apophyllite before it was recognized as different. Cowlesite was called thomsonite, and so was boggsite, until subtle differences were noted that prompted further investigation.

Detailed examination often leads to recognizing small differences in color or form. That is one reason we have been featuring article on various crystal forms. Recognizing what the usual form of crystal a mineral exhibits sensitizes us to recognize different forms and faces, and leads to a special specimen even if not to a new mineral.

Sometimes different conditions can allow a sufficiently good example of a mineral to allow the detailed structural studies necessary to having it recognized. Uranium salts around drying puddles have for years shown numerous fluorescent rings. The material recently discovered at the Blue Lizard Mine in southeastern Utah has produced a whole set of water-soluble sodium uranyl sulfates that have been named recently. The barahonaite-(Al) from Gold Hill waited a number of years before similar material in Spain produced large enough crystals to be studied.

And finally, past chemical analytic methods were difficult enough that some minerals have not been properly characterized. Another look at them often discloses subtle differences that show that what was once thought to be a single species is actually several. The new mineral just announced, fluorwavellite, that is reported on the next page, is an excellent example of this.

So keep looking at your collection and asking questions.

Fluorwavellite

Doug Merson & Don Howard

Another new mineral has been credited to the Silver Coin Mine.

IMA No. 2015-077

Fluorwavellite

 $Al_3(PO_4)_2(OH)_2F \cdot 5H_2O$

Silver Coin mine, Valmy, Iron Point district, Humboldt Co., Nevada, USA (40°55'44"N, 117° 19'26"W),
and
Wood mine, 5 miles NE of Del Rio, Cocke Co., Tennessee, USA (35°57'52"N, 82°57'36"W).

Anthony R. Kampf*, Paul M. Adams, Henry Barwood and Barbara P. Nash *E-mail: <u>akampf@nhm.org</u>

The F analogue of wavellite Orthorhombic: Pcnm; structure determined

a = 9.6311(4), b = 17.3731(12), c = 6.9946(3) Å

8.53(100), 5.65(26), 4.81(17), 3.430(28), 3.223(41), 2.934(15), 2.580(28), 2.101(16)

Cotype material is deposited in the collections of the:

Mineral Sciences Department, Natural History Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, California 90007, USA, catalogue numbers 65600 (W) and 65601 (SC)

How to cite: Kampf, A.R., Adams, P.M., Barwood, H. and Nash, B.P. (2015) Fluorwavellite, IMA 2015-077. CNMNC Newsletter No. 28, December 2015, page 1862; Mineralogical Magazine, 79, 1859–1864.

In private communication, Paul Adams suggests that much of the wavellite from a variety of western localities is probably fluorwavellite. It is going to take time to ascertain that and to reanalyze material. Once again, a number of mineral labels are going to need to be changed.

On the following pages is the updated mineral list from the Silver Coin Mine.

Silver Coin Mine, Iron Point District, Humboldt County, Nevada Mineral List as of January 2015

Paul M. Adams

MINERAL GROUP/SPECIES	LOCATION		DESCRIPTION
ARSENATES /VANADATES/MOLYBDATES			
Adamite Zn ₂ (AsO ₄)(OH)	CS, PS	UC	Clear to light blue prisms.
Agardite-(Y) $(Y,Ca)Cu_6(AsO_4)_3(OH)_6\cdot 3H_2O$	CS	UC	Light blue-green acicular sprays.
Arsendescloizite PbZnAsO ₄ (OH)	AD, SS	R	Orange brown XL balls
Arsentsumebite Pb ₂ Cu(AsO ₄)(SO ₄)(OH)	PS	R	Light green blocky XLs
Austinite CaZnAsO ₄ (OH)	CS	VR	Green XL balls
Bariopharmacosiderite $Ba_{0.5} Fe_4^{3+} [(OH)_4(AsO_4)_3] \cdot 5H_2O$	PS	R	Small yellow cubes
Bayldonite $PbCu_3(AsO_4)_2(OH)_2$		R	Yellow green fine blocky XLs
Calderonite $Pb_2Fe^{-3\pi}(VO_4)_2(OH)$	PS	VR	Orange brown tabular XLs.
$\begin{array}{c c} Carminite & PbFe_2^{-1}(AsO_4)_2(OH)_2 \\ \hline C & c & c & c & c \\ \hline \end{array}$	AD DG GG	VR	Red prismatic XLs.
Conichalcite CaCuAsO ₄ (OH)	PS, SS	R	Light green prismatic XLs
Descloizite $PbZnVO_4(OH)$	AD,PS	R	Dark brown plates
Duffite PbCuAsO ₄ (OH) \mathbf{F}_{res} t \mathbf{h}_{res} t	CS, PS	UC	Yellow green equant XLs.
Ferribushmakinite (IL) $Pb_2Fe^{-}(PO_4)(VO_4)(OH)$	PS	VK D	Steelved elive plotes
Fornacite $Pb_2Cu(AsO_4)(CrO_4)(OH)$	AD	K D	Stacked onve plates.
Gartrenite $PD(Cu,Fe, ZII)_2(AsO_4,SO_4)_2(\Pi_2O,OH)_2$ Mambuita $Pb(E_2^{3+},Z_P) (A_2O_2) (OH H O)$	rs CS DS	K	Vellow to orange elongeted disks
Minetite Pb(Fe $\Sigma II)_2(AsO_4)_2(OII, II_2O)_2$	CS, PS	UC	White prismatic to flattened VL s
Malubdaformacita Db Cu(AcO)(McO)(OH)		D	Light groop to player plates
Motromite Pb2cu(AsO4)(MOO4)(OH)	C5, 55	R D	Dark green plates to glive acicular YL s
Notice and the focus of $O_4(OH)$	DS	D	Small vallow cubes
Olivopite $Cu^{2+}(\Lambda s \Omega_4)(OH)$	PS	IIC	Light green prisms and howties
Dharmacosidarita $KEo^{3+}(AsO_{1})(OH) = 6.7H_{1}O_{1}$	PS	P	Vellow green cubes
Philipsburgite $(\Box Zn) \cdot (\Delta s \Box x) \cdot (\Box H) = H_2 \Box$	PS	R	Emerald green blades
Stolzito DbWO	DS DS	P	Clear EL tabular XLs
Tsumcorito $Pb(7n \text{ Fe}^{3+}) \cdot (\Lambda s \Omega_{4}) \cdot (H_{2} \Omega \Theta \Theta)$	PS PS	K UC	Vellow orange elongated disks
Vanadinite $Pb(VO_1)_2(ASO_4)_2(11_2O_2O_1)_2$		P	Orange prisms
Wulfenite PhMoQ.	CS	R	Orange tabular XI s
Zalesiite $C_{2}C_{12}((A_{S}C_{12}))((A_{S}C_{2}))((OH))((OH))((2H))$	CS	UC	Light blue-green acicular sprays
Zincolivenite/Zincolibethenite (Zn Cu ²⁺	CS PS	UC	Onaque milky light blue prisms
$(2A, O_4, O_4)$	00,10	00	opique miny light olde prisitis.
CARBONATES			
Ankerite CaFe(CO ₃) ₂	?	VR	Tan
Aragonite CaCO ₃	AD	R	White acicular sprays
Aurichalcite (Zn,Cu ²⁺) ₅ (CO ₃) ₂ (OH) ₆	CS, PS	R	Light blue thin blades
Calcite CaCO ₃	PS,SS,CS,AD	С	White crudely formed XLs.
Cerussite PbCO ₃	CS	UC	Colorless flattened XLs
Dolomite CaMg(CO ₃) ₂	PS,AD,CS	С	Clear to white scalenohedra to ballls
Magnesite MgCO ₃	AD	UC	Cores of gray scalenohedral XLs
Malachite Cu_2^{2+} (CO ₃)(OH) ₂	CS, AD	С	Green fibrous balls
Otavite CdCO ₃	CS,SS	R	Thin white epimorphic shells
Rosasite $(Cu,Zn)_2(CO_3)(OH)_2$	CS,PS,SS	UC	Blue green botryoidal.
Smithsonite ZnCO ₃	CS,AD	R	Gray scalenohedral XLs
HALIDES			
Chlorargyrite Ag(Cl,Br)	PS,SS,CS,AD	С	Yellow green cubo-octahedral XLs; vermiform growths
Fluorite CaF ₂	CS, PS	С	Clear to white cubes.
Halite NaCl	PS,CS,SS,AD	UC	Efflorescence
Iodargyrite AgI	PS,AD	VR	Clear crude hexagonal XLs
Paratacamite Cu ₂ ²⁺ Cl(OH) ₃	CS	R	Vitreous blue-green botyroidal
		1	

OXIDES/HYDROXIDES			
Bindheimite Pb ₂ Sb ₂ O ₆ (O,OH)	AD	R	Yellow pseudomorphs after?
Cuprite Cu ₂ ¹⁺ O	AD	R	Ruby red
Goethite FeO(OH)	PS,SS,CS,AD	С	Brown earthy to shiny black botryoidal
Rosiaite PbSb ₂ 5+O ₆	AD	VR	Tiny white XLs with cinnabar
Rutile TiO ₂	AD	VR	Black striated XLs
PHOSPHATES			
Beraunite $Fe^{2+}Fe_5^{3+}(PO_4)_4(OH)_5 \cdot 4H_2O$	PS	VR	Dark green radiating laths
Cacoxenite $AlFe_{24}^{3+}(PO_4)_{17}O_6(OH)_{12} \sim 75H_2O$	PS	R	Orange radiating acicular
Crimsonite (TL) $PbFe_2^{5+}(PO_4)_2(OH)_2$			
Churchite-(Y) YPO ₄ ·2H ₂ O	AD	VR	In polished section
Crandallite CaAl ₃ (PO _{3.5} (OH) _{0.5}) ₂ (OH) ₆	PS	С	White pearly rosettes
Cyrilovite $NaFe_3^{3+}$ (PO ₄) ₂ (OH) ₄ ·2H ₂ O	PS	С	Yellow waxy botryoidal
Faustite $(Zn,Cu)Al_6(PO_4)_4(OH)_8 \cdot 4H_2O$	PS	VR	In polished section
Fluorapatite Ca ₅ (PO ₄) ₃ (F)	ALL	С	White hexagonal XLs and balls
Fluorowardite (TL) NaAl ₃ (PO ₄) ₂ F ₂ (OH) ₂ ·2H ₂ O	PS	UC	Tiny clear pseudo cubo-octhedral XLs
Fluorphosphohedyphane Ca ₂ Pb ₃ (PO ₄) ₃ F	SS	R	In polished section
Flourwavellite (TL) Al ₃ (PO ₄) ₂ (OH) ₂ F·5H ₂ O			
$Ginite Fe^{2+}Fe^{3+}_4(PO_4)_4(OH)_2 \cdot 2H_2O$	PS	UC	Olive brown botryoidal
Gorceixite $BaAl_3(PO_{3,5}(OH)_{0.5})_2(OH)_6$	PS	UC	White pearly rosettes
Hentschellite $CuFe_2^{-1}(PO_4)_2(OH)_2$	PS	R	Dark blue green XLs
Langreyite (TL) $Ca_2AI_7(PO_4)_2(PO_3OH)_2(OH,F)_{15} \cdot 8H_2O$	PS	C	White pearly rosettes
Kidwellite $Na(Fe_9^{-1})(PO_4)_6(OH)_{10} \cdot 5H_2O$	PS,CS,AD	C	Light to dark green balls, often over lipscombite
Kintoreite $PbFe_3^{-1}(PO_{3.5}(OH)_{0.5})_2(OH)_6$	PS DS	K	Encould mean blader
Kipushite $(Cu,Zn)_6(PO_4)_2(OH)_6 \cdot H_2O$	PS DS	K	Emerald green blades
Krasnoite (1L) $Ca_3AI_{7,7}SI_3P_4U_{23,5}(OH)_{12,1}F_{2}\cdot 8H_2U$ Libethomite $Cu_2^{2+}(PO_2)(OH)_{12,1}F_{2}\cdot 8H_2U$	PS DS	VD	Plaalu groep VI a
Libethemite Cu_2 (PO ₄)(OH) Lipscombite $Ec^{2+}Ec^{3+}$ (DO) (OH)	PS CS AD	VK C	BIOCKY gleen ALS
Lipscombite $Fe Fe _2(FO_4)_2(OH)_2$	PS,CS,AD		Flattened alear/white resettes
Leucophosphile Kie $_2(FO_4)_2(OH)^2H_2O$	DS	UC	White radiating on blue green varisaite
Mourigite No. (TL) (Na K) Ea^{3+} (PO(1)-(OH)-8HaO	PS AD	UC	Vellow acicular sprays
$\mathbf{Millisite} \qquad (N_2 K)C_2 \Lambda I_2(\mathbf{PO}_1)_2(\mathbf{OH})_2 \mathcal{H}_2 \mathcal{O}$	PS	UC	Light brown microXI Line balls
Montgomervite $C_2 Mg \Delta L(PO_4) + (OH) + 12H_2O$	AD	UC	Thin white blades
Morinite $N_{2}(C_{2},C_{1})_{2}A_{1}(O_{4})_{2}(OH)E_{1}^{2}H_{2}O$	PS	C	White gray light blue microXI balls
	PS CS AD	UC	Platy rosettes/halls
$N_{4}(P_{4}^{3+}, P_{4}^{2+})(P_{4}^{3+}, A_{4}^{3+}) = (PO_{4})_{4}(OH)_{6} \cdot 2H_{2}O_{4}$	15, 65, 115	00	They reserves builts
Perhamite $Ca_2Al_7 = 7Si_2P_4O_{22} = 5(OH)_{14} + 8H_2O$	PS	С	White pearly rosettes
Phosphohedyphane $Ca_2Pb_3(PO_4)$	CS	R	Grav prismatic XLs
Phosphosiderite Fe ³⁺ PO ₄ ·2H ₂ O	PS	UC	White microXLine with strengite
Plimerite $ZnFe^{3+}(PO_4)_3(OH)_5$	CS,PS	R	Yellow green blades
Plumbogummite PbAl ₃ (PO _{3.5} (OH) _{0.5}) ₂ (OH) ₆	PS,AD	С	White to light brown pearly rosettes
Pseudomalachite Cu ²⁺ ₅ (PO ₄) ₂ (OH) ₄	PS	VR	Dark green blue balls
Pyromorphite Pb ₅ (PO ₄) ₃ Cl	CS	R	White to gray prismatic
Rhabdophane-(Ce) (Ce,La)PO ₄ ·H ₂ O	PS	VR	In polished section
Rockbridgeite $Fe^{2+}Fe^{3+}_4(PO_4)_3(OH)_5$	PS	R	Dark green
Strengite Fe ³⁺ PO ₄ ·2H ₂ O	PS	UC	White microXLine
Tinticite $(Fe^{3+})_6(PO_4)_4(OH)_6.7H_2O$	PS	R	Light brown blocky XLs
Tinsleyite KAl ³⁺ ₂ (PO ₄) ₂ (OH)·2H ₂ O	PS	R	Light purple flattened rosettes
Turquoise CuAl ₆ (PO ₄) ₄ (OH) ₈ ·4H ₂ O	PS	UC	Light blue to gray triclinic XLs and balls
Variscite AlPO ₄ ·2H ₂ O	PS, AD	UC	Clear, white to light green cubo-octahedral XLs
Wardite NaAl ₃ (PO ₄) ₂ (OH) ₄ ·2H ₂ O	PS	R	White microXLine crusts
Wavellite Al ₃ (PO ₄) ₂ (OH,F) ₃ ·5H ₂ O	PS, CS, AD	С	Clear radiating sprays and balls
Zinclipscombite (TL) ZnFe ³⁺ ₂ (PO ₄) ₂ (OH) ₂	PS,AD	UC	Dark green to black XL balls
SILICATES			
		_	
Apophyllite (K,Na)Ca ₄ Si ₈ O ₂₀ (OH,F)·8H ₂ O	PS	R	
Chrysocolla (Cu,Al) ₂ H ₂ Si ₂ O ₅ (OH) ₄ ·nH ₂ O	CS, AD	С	Light blue after malachite
Hemimorphite Zn ₄ Si ₂ O ₇ (OH) ₂ ·H ₂ O	CS, PS, AD	C	Clear blades
Kaolinite $Al_2Si_2O_5(OH)_4$		C	White massive. Constituent of igneous intrusive .
NUISCOVITE $KAl_2 \square AlSi_3)_{10}(OH)_2$		C	Constituent of igneous intrusive.
Quartz S1O ₂	ALL	С	

SULFATES			
Alunite	K PS,II	С	Pale yellow hexagonal plates
Anglesite PbSO ₄	PS	VR	Clear equant XLs
Anhydrite CaSO ₄	PS	R	White massive with gypsum
Barite BaSO ₄	PS,CS,AD,SS	С	Clear tabular XLs
Beudantite $PbFe_3^{3+}(As_{0.5}, S_{0.5}O_4)_2(OH)_6_$	PS	R	Light brown pseudo octahedral XLs
Brochantite Cu ₄ (SO ₄)(OH) ₆	CS	UC	Green prismatic XLs
Caledonite Pb ₅ Cu ₂ (CO ₃)(SO ₄) ₃ (OH) ₆	PS, AD	VR	Light blue prismatic XLs
Connellite $Cu^{2+}_{19}Cl_4(SO_4)(OH)_{32}\cdot 3H_2O$	AD	VR	Light blue fibers
Corkite PbFe ₃ 3+(P _{0.5} ,S _{0.5} O ₄) ₂ (OH) ₆	AD	UC	Light brown hexagonal plates
Creedite $Ca_3Al_2(SO_4)(OH)_2F_8\cdot 2H_2O$	CS	R	Clear to white radiating spheres
Cyanotrichite Cu ₄ Al ₂ (SO ₄)(OH) ₁₂ ·2H ₂ O	CS	VR	Fine blue fibers
Gypsum CaSO ₄ ·2H ₂ O	PS,CS,SS,AD	С	Clear vein fillings, rosettes
Hidalgoite PbAl ₃ (As _{0.5} ,S _{0.5} O ₄) ₂ (OH) ₆	PS	R	Flattened octahedral XLs
Hinsdalite $PbAl_3(P_{0.5},S_{0.5}O_4)_2(OH)_6$	PS	UC	Yellow green rhombs
Jarosite KFe ₃ 3+(SO ₄) ₂ (OH) ₆	PS,CS,SS,AD,II	С	Brown to butterscotch hexagonal XLs
Leadhillite Pb ₄ (SO ₄)(CO ₃) ₂ (OH) ₂	AD	R	Clear tabular XLs
Linarite PbCu ²⁺ (SO ₄)(OH) ₂	CS	R	Blue bladed XLS
Munakataite Pb ₂ Cu ₂ (Se ⁴⁺ O ₃)(SO ₄)(OH) ₄	AD	R	Blue acicular XLs
Natroalunite NaAl ₃ (SO ₄) ₂ (OH) ₆	PS,AD	UC	Clear rhombohedral XLs, white plates
Natrojarosite NaFe ₃ ³⁺ (SO ₄) ₂ (OH) ₆	PS	UC	Minute yellow octahedral XLs
Osarizawaite Pb(Al,Cu) ₃ (SO ₄)(OH) ₆	AD	R	Clear octahedra
Plumbojarosite $Pb_{0.5} Fe_3^{3+} (SO_4)_2 (OH)_6$	CS	R	Brown octahedra
Spangolite Cu ₆ ²⁺ Al(SO ₄)(OH) ₁₂ Cl·3H ₂ O	CS	R	Blue green platy to equant XLs
Thenardite Na ₂ SO ₄	PS, SS, CS	UC	Efflorescence
SULFIDES/SULFOSALTS/ELEMENTS			
Acanthite Ag ₂ S	AD	R	In polished section
Boulangerite Pb ₅ Sb ₄ S ₁₁	AD	R	Gray needles
Chalcopyrite CuFeS ₂	AD	UC	Brassy
Cinnabar Hg ₂ S	AD	VR	Ruby red
Covellite CuS	AD	R	Purple irridescence
Galena PbS	AD	UC	Gray cleavages
Owyheeite Ag ₃ Pb ₁₀ Sb ₁₁ S ₂₈	AD	UC	Long gray acicular XLs
Polybasite (Ag,Cu) ₁₆ Sb ₂ S ₁₁	AD	R	Hexagonal plates
Pyrargyrite Ag ₃ SbS ₃	AD	R	
Pyrite FeS ₂	PS, AD	С	Brassy cubes
Robinsonite Pb ₄ Sb ₆ S ₁₃	?	R	
Schachnerite - Paraschachnerite Ag _{1.1} Hg _{0.9}	AD	VR	Silver gray massive
Silver Ag	PS	R	Black micro coating on chlorargyrite
Sphalerite ZnS	AD	<u>C</u>	Resinous brown cleavages
Tetrahedrite Cu ₆ [Cu ₄ (Fe,Zn) ₂]Sb ₄ S ₁₃	AD	R	-

Key to symbols:

(TL) = Type Locality

PS = Phosphate Stope, SS = Silver Stope, CS = Copper Stope, AD = Arsenate Drift, II = Igneous Intrusive C = Common, UC = Uncommon, R = Rare, VR = Very rare

Another Form of Synchysite at Washington Pass

Don Howard and Paul Adams

It seems that the Parisite Boulder on the talus pile beneath Liberty Bell doesen't contain parasite after all. The small, orange hexagonal prisms scattered on the white microcline that coats the underside of that boulder have been analyzed by Paul Adams, and they prove to be the same sort of zoned synchysite that we have found elsewhere: synchysite-(Ce) on the inside with synchysite-(Y) on the outside.



Fig. 1 Synchysite-(Y)/synchysite-(Ce) on microcline "Parisite" Boulder, Liberty Bell, Washington Pass

The crystal studied was sectioned parallel to the c-axis rather than perpendicular this time. The resulting scans are very similar to those reported earlier for material from the Blue Dike.

Spectrum 13



Fig. 2 An SEM image of the crystal section, with EDAX graphs of the composition taken from the two positions shown.

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Fig. 3. Three EDAX 'maps' of the distribution of the three elements cerium, calcium & yttrium

The three distributional diagrams in fig. 3 display the distribution of elements in the crosssection. Calcium is spread evenly throughout. Yttrium dominates in the outer portions, while cerium is dominant in the inner block and a few scattered regions below. The crystal exhibits an early key central rod of composition Ca (Ce,Nd) (CO₃)₂ F with very little yttrium present (see the upper graph in fig. 2), and certain other minor regions which may at some time have been fragments or other crystals of similar orientation. This is surrounded by material of composition Ca Y (CO₃)₂ F with only a minor amount of cerium and neodymium. The very outermost rim also shows a fair amount of thorium substituting for the yttrium. There is measureable iron only in the very outermost skin, which may very well be responsible for the overall orange color.

Our conclusion is that this is another example of a synchysite-(Y)/synchysite-(Ce) zoned crystal. The form and color is different than the material previously reported¹ from blue dike material collected on the Liberty Bell tallus, but the chemical composition appears to be identical.

References:

1. Paul Adams & Donald Howard, *Synchysites from the Blue Dike, Liberty Bell, Washington Pass, Okanogan Co., Washington*, Microprobe Vol. XI #10, pg 14 (Fall, 2014).

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Tschernichite from the Czech Republic by Rudy W. Tschernich 300 Alps Road, Unit 1007 Moxee, Washington 98936

Since the original discovery of tschernichite in 1972 and it's naming in 1993, tschernichite has been found at six different localities scattered throughout the world (Mindat.com).

- 1) Goble, Oregon (type locality)
- 2) Costa Rica
- 3) Antarctica
- 4) New Zealand
- 5) Hungary
- 6) Czech Republic

The latest discovery of tschernichite is at Jehla (needle) near a little town of Ceska Kamenice (Fig. 2), a town of population 5,500 in the Usti nad Labem region of Bohemia near the border with Germany (Paulis, P. and others, 2015). It was discovered by Libor Hruzek in 2014 who lives in the nearby town of Kamenicky Senov (Fig. 2, center). What is of interest to me is that some of my relatives lived and worked in Kamenicky Senov when it was known in German as Steinschonau. They



were glass engravers and owned the Lorenz Brothers Glass Company that engraved Bohemian glass. Their company building still stands today and some of their glass is on display in the local glass museum. Furthermore, my father, Rudolf W. Tschernich was born in 1911 at Novy Bor (Fig. 2 red pin) a

town just 17 km (7.5 miles) from where the tschernichite was found. Looks like things have made a full circle.

The zeolites occur in the Central Bohemian Uplands (Ceska Stredohori). The site known as Jehla or needle, is near the town of Ceska Kamenice (Fig. 3 upper yellow pin), Decin, Usti Region, Bohemia, Czech Republic near the northern border with Germany.



Figure 2 Northern Bohemia in the Czech Republic.



Figure 3 Jehla north of Ceska Kamenice



Figure 4 Jehla or needle. Photo by Libor Hruzek

Jehla consists of the contact zone between trachybasalt and volcanic breccia which contains significant amount of quartz and granite xenoliths, and rounded Cretaceous sandstone pebbles. Tschernichite was found in 2014 by Libor Hruzek in a few loose rock fragments that remained from quarrying long ago. The tschernichite forms simple dipyramids with a "c" face termination usually on compound hexagonal erionite needles followed by levyne. The colorless tschernichite crystals are tiny, usually under 1 mm long, are hard to spot. Unlike the Neer Road, Goble, Oregon site, where tschernichite is the first zeolite to crystallize in the silica-rich cavities, at Jehla, tschernichite occurs on erionite-K and is followed by levyne-Ca.



The chemical analysis by Jiri Sejkora at the National Museum in Prague indicates the tschernichite is dominant in calcium but rich in potassium with a minimum of sodium and magnesium.

Minerals present at the Jehla site include:

analcime calcite chabazite-Ca cowlesite erionite-K garronite-Ca gismondine heulandite-Ca levyne-Ca natrolite phillipsite-Ca quartz stilbite-Ca thomsonite-Ca tschernichite

See Mindat.com for photos



Acknowledgement:

I thank Libor Hruzek for the photos and information about Jehla. His help in understanding the Czech zeolites and my families background is greatly appreciated.

References:

Paulis, P., Hruzek, L., Janecek, O., Sejkora, J., Malikova, R., Pour, O., and Fediuk, F. (2015) *Tschernichite, Garronite-Ca and zeolite associated zeolite mineralization from Jehla near Ceska Kamenice, Czech Republic.* Bulletin Miner. Odd. National. Museum, Prague 23, 2

Hemimorphism

Don Howard

Another of those big, technical terms that describes something about crystals. But what on Earth does it mean? It sounds like it has something to do with hemimorphite?

Well let's take a look. My *New Collegiate Dictionary* say"-morph" is an ending denoting "*one characterized by a specific form*", and "hemi-" signifies half of something, as in hemisphere, so the word literally means "something characterized by halves". Actually, the dictionary definition is "*assymetrical in form, as regards the two ends of an axis*". Did that actually help?

What is really being said here, is that a hemimorphic crystal is one where the two ends of the crystal may look different. That is a statement about symmetry. So we can equally well use symmetry terms to define the word. It refers to a crystal that lacks certain symmetry elements, namely, there is no mirror plane perpendicular to the major (long) axis of the crystal. Also, there must not be a center of inversion, or any 2-fold rotation axes perpendicular to the major axis of the crystal.

Armed with a more mathematical definition, we can then examine which of the 32 crystal classes lack the necessary symmetry operations to be able to qualify as hemimorphic. None of the 5 classes in the isometric system qualify. For the other systems, 10 classes qualify:

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Tetragonal	4mm ;
Hexagonal	6mm ;
Trigonal	3m ; 3
Orthorhombic	mm2
Monoclinic	2; m
Triclinic	1

These are all the lower symmetry classes of each system, and there are not very many minerals that fall into them, but there are a few. If you can see both ends, the crystals look rather strange because the ends can be strikingly different. Even if you can see only one end, neighboring crystals may have a different set of faces and easily look like two different minerals rather than a single species.

The most obvious mineral member, of course, is hemimorphite, which was named because of this property. Hemimorphite belongs to the orthorhombic class mm2. The crystals tend to grow in nearly parallel bundles emanating from a single nucleation point on the matrix, and when they do, all the members of the group tend to have the same end of the crystals sticking out. That is the case with the picture at right. You may notice that most of the crystals on the right of the cluster have a pointed termination like the end of a fence picket, while those on the left have a much more flattened end.



Fig. 1. Hemimorphite crystals on Baryte Lead Mountain, Barstow, San Bernardino Co., Calif.

Another two fairly common hemimorphic minerals are both members of the **3m** class of the Trigonal system: tourmaline and pyrargyrite. Tourmaline is not a good candidate to look to in order to observe this effect, since the crystal ends are often flat, or worse yet rough and irregular.

But pyrargyrite is an excellent representative. In fact, it was looking at the rather odd appearing crystal shown in fig. 2 that got me interested enough to pursue this subject. Notice how one end is rounded and the other end is simply cut off flat. That is the signature of a truly hemimorphic mineral.



Fig. 2. Hemimorphic Pyrargyrite on Quartz Zaca Mine, Markleeville, Alpine Co., Calif.

A second view of pyrargyrite from the same location (fig. 3) shows two crystals, one in profile

(showing the rounded end) and the other looking directly down the c-axis at the flattened end, which shows some ridging and is rather striated. I have made an attempt to diagram the possible faces for the crystal on the right, assuming it too has the flat bottom c-face.



Fig. 3. Pyrargyrite on Quartz Zaca Mine, Markleeville, Alpine Co., Calif.

Lower symmetry crystal systems have an even greater chance to show hemimorphic behavior. Consider the crystals of heulandite shown in fig. 5. Heulandite is normally assigned to the monoclinic class 2/m, but these crystals are not compatible with that designation. Instead, the diagram above fig. 5 has been drawn under The assumption that heulandite belongs to class 2. The information about this occurrence of heulandites can be found in *The Microprobe*, Vol. VII, #9, pg. 19 and more completely in Vol. VIII, #1, pg. 4.

If you have examples of hemimorphic crystals with both ends visible, I would really like to see them, and possibly get more pictures. Bring them along to the next meeting and we can marvel over them.



Fig. 4. Possible diagram of the right-hand crystal in fig. 3.





Fig. 5. Heulandite Moses, Whitman Co., Wash.